



NITROGÉN MŰVEK RT.

*N₂O emissions reduction project
at the new acid plant at Nitrogénművek Rt.*

Project Design Document

October 2004

TABLE OF CONTENTS

1. PROJECT INFORMATION	1
1.1 SUPPLIER DATA	1
1.2 CORRESPONDER’S DATA	1
1.3 PROJECT ABSTRACT	2
1.3.1 Key data of the project	2
1.3.2 Project definition.....	2
1.3.3 Project summary	2
1.4 BACKGROUND AND JUSTIFICATION	3
1.4.1 History of Nitrogénművek.....	3
1.4.2 Necessity of the Project.....	4
1.4.3 Current state.....	4
1.4.4 Commercial and legal background of fertilizer sales	6
1.4.5 Major contracts of Nitrogénművek.....	8
1.5 INTRODUCTION OF THE PLANNED ACTIVITY	9
2. TECHNOLOGY DESCRIPTION	10
2.1 LOCATION OF THE PROJECT.....	10
2.2 SCOPE OF ACTIVITY	11
2.3 TECHNOLOGY DESCRIPTION	11
2.3.1 Acid production technology	11
2.3.2 N ₂ O reduction technologies	12
2.3.3 The selected technology.....	13
2.3.4 Short introduction of references	16
2.3.5 Implementation.....	17
3. BASELINE STUDY	20
3.1 SPECIFICATION OF THE MOST LIKELY BASELINE SCENARIOS.....	20
3.1.1 Brief description of alternatives.....	20
3.2 JUSTIFICATION OF ADDITIONALITY.....	22
3.2.1 Issues concerning additionality	22
3.2.2 Additionality tests	25
3.3 GHG SOURCES AND SYSTEM BOUNDARIES	26
3.4 APPLIED BASELINE METHOD.....	29
3.4.1 Baseline calculation method	29

3.4.2	Project line calculation method	30
3.4.3	Application of the method	31
3.5	BASELINE EMISSIONS.....	31
3.5.1	Baseline estimation methodology	31
3.5.2	Calculation of baseline emissions.....	33
3.6	PROJECT LINE EMISSIONS	34
3.7	EMISSIONS REDUCTION	35
3.8	UNCERTAINTIES.....	35
4.	MONITORING AND REPORTING PLAN	36
4.1	AIM OF THE MONITORING PLAN.....	36
4.2	REQUIREMENTS CONCERNING THE MONITORING ACTIVITY.....	36
4.3	MEASUREMENT OF MAJOR PARAMETERS.....	36
4.3.1	Measurement of nitric acid produced	36
4.3.2	Emissions measurement	36
4.4	CALCULATION OF CO ₂ EQ EMISSIONS REDUCTION DURING MONITORING	40
4.5	MEASUREMENT ACCURACY	41
4.6	DATA COLLECTION METHOD.....	42
4.7	THE SCOPE OF DATA COLLECTION, ITS FREQUENCY AND THE RELATED RESPONSIBILITIES	42
4.8	MANAGEMENT OF UNEXPECTED SITUATIONS	43
4.8.1	Management of emissions outside the measurement limits	43
4.8.2	Management of data loss.....	44
4.9	“LEAKAGE”	44
4.10	MONITORING TRAINING PROGRAMME.....	44
4.11	MONITORING REPORT	44
5.	ENVIRONMENTAL EFFECTS	45
6.	USE OF PROCEEDS FROM SALE OF ERUS.....	46
7.	MAJOR RISKS DURING THE IMPLEMENTATION OF THE PROJECT	47
7.1	IMPACT OF THE EU ETS	47
7.1.1	Extension of the EU ETS to the chemical sector from 2008.....	47
7.1.2	Impacts and mitigation of risks.....	48
7.1.3	The Linking Directive	48
7.2	THE IMPLEMENTATION OF THE NEW NITRIC ACID PLANT	49
7.3	MARKET RISK	49
7.4	LEGAL RISK.....	50

7.5	CONSTRUCTION RISK FACTORS.....	51
7.6	TECHNOLOGICAL RISK.....	51
7.7	OPERATIONAL RISK.....	52
8.	STAKEHOLDER COMMENTS	53
I.	APPENDIX: THE LOCATION OF NITROGÉN MŰVEK AND THE PROJECT	54
II.	APPENDIX: MONITORING AND REPORTING SHEETS.....	55
III.	APPENDIX: ORGANISATIONS CONCERNED	57

1. PROJECT INFORMATION

1.1 Supplier data

Company name:	Nitrogénművek Rt.
Visiting address:	Pétfürdő, Hősök tere 14.
Postcode:	8105
Postal address:	8105, Pétfürdő, Pf.: 450
Web site:	http://www.nitrogen.hu/
No. of Employees:	898
Location of Trade Register:	Pétfürdő
City:	Pétfürdő
Registration number:	19-10-000148
Date of registration:	1 February 1990
Bank account number:	10402908-29010644-00000000
Bank name:	Kereskedelmi és Hitelbank Rt.
Company's core business:	Fertilizer production
Tax number:	10325957-2-19
Country:	Hungary
Contact person:	Dr. István Blazsek
Job title:	Technical Manager, Assistant General Manager
Telephone No.:	+36 88 620 104
Fax:	+36 88 620 102
E-mail:	blazsek@mail.nitrogen.hu

1.2 Corresponder's data

Company name:	Vertis Environmental Finance
Visiting address:	Alkotás utca 39/c
Zip code + city address:	1123 Budapest
Postal address:	same
Web site:	http://www.vertisfinance.com/
Country:	Hungary
Contact person:	Mr. Barna Baráth
Job title:	Managing Director
Telephone number:	+36 1 488 8422
Fax number:	+36 1 48808411
E-mail:	barna.barath@vertisfinance.com

1.3 Project abstract

1.3.1 Key data of the project

- Project Title: N₂O emissions reduction project at the new acid plant at Nitrogénművek Rt.
- Country: Hungary
- Location: Pétfürdő

1.3.2 Project definition

The Nitrogen Works Chemical Industry Corporation (hereinafter referred to as “Nitrogénművek” or “Company”), the only industrial nitrogen fertilizer production facility in Hungary, plans to install an N₂O emissions reduction catalyst in its new weak acid plant. The present project design document focuses on the N₂O emissions reduction catalyst, as well as the technological modifications necessary for its installation and operation in the acid plant (hereinafter referred to as “the Project”).

1.3.3 Project summary

The catalyst to be implemented in the new acid plant will reduce the N₂O content of the tail gas by 85% (to 150 ppm) as a result of catalytic processes taking place at medium temperature (400-500°C). Installed in the waste gas treatment reactor, the catalyst will additional ammonia feed for its operation.

Plans to build the new acid plant are already well advanced, but the decision concerning the installation of a catalyst depends on the possibilities to raise revenue from the sale of emission reductions. The significant milestones related to the new acid plant are as follows:

- Decision on the establishment of the new acid plant: January 2004
- Concluding an agreement with the main contractor: November 2004
- Start of the acid plant’s construction: January 2005
- Selecting the supplier of the catalyst: July 2006
- Start of the catalyst’s construction: September 2006
- Start of commercial operation: October 2006

Final decisions on installation of the catalyst depend on potential revenues from emissions trading. The data concerning the Emission Reduction Units (ERUs) to be delivered are as follows:

- Period for satisfying the demands for Emission Reduction Units (ERUs): 1 January 2008 - 31 December 2012
- The estimated total demand for ERUs to be delivered: 3.5 million ERUs

1.4 Background and justification

1.4.1 History of Nitrogénművek

Nitrogénművek was founded on 1 January 1990, with its production capacities located on the Pétfürdő site. The company's major profile is fertilizer manufacturing, including mostly nitrogen-based products.

The beginning of fertilizer production in Pétfürdő dates back to the early 1930's when the company's operation was launched upon a government initiative. Following the merger of the ammonia and fertilizer

Figure 1: Nitrogénművek Rt.



plants in the form of a company limited by shares in 1933, the corporation continued its operation under government control and supervision. After World War II, the development and the expansion of the company was regarded as a high priority by the state. The large capacity new fertilizer factory, which was built in 1975, has played an important role in the domestic fertilizer production industry until the present day.

Nitrogénművek started its operation in its present structure on 1 February 1990. The company completed the development of new strategies, the restructuring of the product portfolio and the modernisation of the organisation. Nitrogénművek has been operating profitably since 1994. In 1995, a medium term infrastructure modernisation project was launched. It was primarily devised for energy rationalisation, production capacity increase and improvement of product quality. The company's marketing policy strategy focused on satisfying domestic demand for nitrogen fertilizers. However, the company is also involved in some export activities to support the continuous and balanced operation of its production capacities.

Nitrogénművek is the only Hungarian nitrogen fertilizer producer, having an approximately 60% share in the market of nitrogen fertilizers. The most important raw material for fertilizer manufacturing is ammonia, which is prepared and processed in Pétfürdő. The Company also produces other chemical products (nitric acid), industrial gases (argon, nitrogen), as well as sorbite and diabetic sweeteners.

In 2002, the ownership structure of the company underwent a significant change: Bige Holding Invest Kft. acquired the ordinary shares of the former two owners (MOL Rt. and Hydro Central Europe B.V.), registered as of 15 November 2002.

1.4.2 Necessity of the Project

The catalyst is capable of reducing the N₂O content of the tail gas to approximately 150 ppm (0.015 tf%) from an estimated 1000 ppm (0.1 tf%) tail gas emission of the new acid plant. Since N₂O emissions are not regulated in Hungary and the catalyst is not an essential part of the acid production process, the implementation of the Project is voluntary and serves only environmental purposes.

1.4.3 Current state

The current production activity of Nitrogénművek is carried out in five plants whose manufacturing phases are built upon one another. Acid production depends on the demand for fertilizer. The following table summarises the major production units and capacities of Nitrogénművek:

Table 1: The major production units and capacities of Nitrogénművek

Name of plant	Capacity
Ammonia plant	1,200 t/day
Urea plant	600 t/ day
Nitric acid plant *	4x 350 t/ day + 270 t/ day
“Pétisó”(NH ₄ NO ₃ +CaMg(CO ₃) ₂) plant	1,500 t/ day
AN plant	600 t/ day

* Significant for N₂O emissions

The capacities of the individual plants are interrelated; the simultaneous availability of the plants is essential to optimal utilisation of total manufacturing capacity. This condition is not met in the case of the acid plants, whose current state obstructs the optimal operation of the whole production process. At present, Nitrogénművek operates four weak acid units, each with an individual capacity of 350 t/day. These facilities were built in 1975 on the basis of the technology provided by Russian company GIAP-Moscow. The manufacturing data of the acid plant is summarised in the following table:

Table 2: The manufacturing data of the acid plant in the past few years

Raw materials used		1999	2000	2001	2002	2003
Ammonia	t	87,714	109,956	118,176	74,736	82,767
Natural gas	eNm ³	39,553	45,774	46,775	30,052	33,467
Acid produced	t	289,700	363,315	388,999	243,593	268,902

Figure 2: Old acid plant at Nitrogénművek



Through periodic replacement of equipment at the old acid plant, these units could continue to operate for 8-10 more years, but considering the increasing costs of replacement, the plant's economic results would also deteriorate continuously. In order to preserve the competitiveness of Nitrogénművek and sustain the continuity of production, the company's management decided on the more economical and reasonable solution of replacing the old nitric

acid and pétisó (fertilizer) plants with new facilities, because the current technological level is unsatisfactory and the maintenance costs are high. Thus, the company will not carry out the replacement of the GTT-3M units due between 2006 and 2010, but will instead decommission the plant in 2006 and establish, as a greenfield investment, a new acid production facility fully complying with the present technological and technical requirements. The design, permitting and implementation processes of the acid plant investment and the Project will take place simultaneously.

Current N₂O emissions

The historic N₂O emissions of Nitrogénművek are included in the following table. The quantity of greenhouse gas N₂O, which has a GWP¹ of 310, is given in CO₂ equivalents (CO_{2eq}). CO_{2eq} will also be used as the basis of calculations below.

Table 3: Historic N₂O emissions

Historic data		1999	2000	2001	2002	2003
Capacity (4*350 t/day)	t/day	1,400	1,400	1,400	1,400	1,400
Annual acid production (measured)	t/year	289,700	363,443	389,158	243,638	268,902
Annual operating time	day	207	260	278	174	192
Quantity of acid produced	t/h	58.33	58.33	58.33	58.33	58.33
Quantity of tail gas per one ton of acid	Nm ³ /t	4,800	4,800	4,800	4,800	4,800
Quantity of tail gas	eNm ³ /year	1,390,560	1,744,526	1,867,958	1,169,462	1,290,730
Average N ₂ O concentration in tail gas (measured)*	ppmv	1,370	1,370	1,370	1,370	1,370
Average quantity of N ₂ O in tail gas	tf%	0.137	0.137	0.137	0.137	0.137
Annual N ₂ O flow, volume	eNm ³	1,905	2,390	2,559	1,602	1,768
Annual N ₂ O amount	t	3,740	4,693	5,025	3,146	3,472
N ₂ O emission factor**	CO _{2e}	310	310	310	310	310
Annual CO_{2e} emission	tCO_{2e}/year	1,159,532	1,454,691	1,557,616	975,168	1,076,288

* Measurement period: 2004.03.-2004.06.

** Source: IPCC 2001

Table 4: Specific N₂O emission

		1999	2000	2001	2002	2003
Specific N ₂ O emission	kgN ₂ O/tHNO ₃	12.91	12.91	12.91	12.91	12.91

The present acid plant does not use any N₂O emissions reduction technology. An N₂O measurement instrument was installed in the facility in March 2004 and the quantity of this gas has been measured continuously since that time. Moreover, the O₂, NH₃, and CO content of the tail gas is also measured regularly.

Using a high temperature (920 °C) platinum catalyst in the ammonia combustion unit, the amount of N₂O in the tail gas will range between 1,000 and 1,900 ppm. The data on N₂O concentration included in Table 3 shows the average of values measured during the period following the installation of the measuring instrument (March-June 2004).² The emissions measured in this period range between a minimum of 1006 ppm and a maximum of 2,005 ppm. In this period, a non-selective catalytic reduction (NSCR) catalyst was used for the reduction of NO_x, which was changed to a selective catalytic

¹ Global Warming Potential, IPCC, 2001

² Prior to the installation of the measuring instrument, the concentration of N₂O in the tail gas was not measured, since no relevant legal provisions obliged the Company to do so.

reduction (SCR) catalyst unit in May 2004 to improve efficiency and to reduce energy costs and environmental contamination.

After annual maintenance N₂O measurement has continued. The average N₂O emission registered under SCR technology in August-September 2004 was 1,580 ppm. The emissions measured in this period range between a minimum of 1,056 ppm and a maximum of 2,420 ppm. The measured values are registered in each shift (at 6 a.m., 4 p.m., 10 p.m.).

The amount of historic N₂O emissions cannot be specified by calculation, because the diversity of reactions taking place makes this impossible. Since the technology and the major parameters have not changed in the period examined (1999-2003), we can assume that the amount of N₂O in the emitted gas was similar to the amount registered in the measurement period (in 2004). This assumption is also supported by the value (10-19 kgN₂O/tHNO₃) included in the working copy of the Best Available Technology (BAT) reference document (BREF)³ currently under discussion, and in the technology data concerning the acid production facilities built before 1975 included in the IPCC guidelines drawn up for preparation of UNFCCC national inventories⁴.

1.4.4 Commercial and legal background of fertilizer sales

Since both acid production and N₂O generation fully depend on the fertilizer market, we will focus on the current and expected future situation of the fertilizer sector in our market analysis.

The current market position of Nitrogénművek

Nitrogénművek is the only industrial-scale Hungarian producer of nitrogen-based substances. The product portfolio of Nitrogénművek is dominated by fertilizers, which represent about 90% of total corporate production, expressed as a percentage of sales revenues. Its competitors for market share are imports. In 2003, the company's domestic fertilizer sales amounted to a total of 155,000 tonnes as calculated in nitrogen ingredients, resulting in net sales of 22,900 million HUF, which was 444 million HUF higher than the income generated in 2002.

The significant decrease in production in 2002 and the beginning of 2003 was caused by the removal of a customs tariff that had protected the market position of local producers. As a result, Hungarian domestic production fell as it faced strong price competition with fertilizers imported mostly from Ukraine. After the restoration of the customs levy in 2003, production started to recover again.

Export sales are mainly based on solid fertilizers, within which urea is the most important product. The 2003 export revenue of the company was 4,825 million HUF,

³ Integrated Pollution Prevention and Control, Seville, March 2004

⁴ IPCC Good Practice Guidance and Uncertainty management in National Greenhouse Gas Inventories, 2000: Table 3.8 Default factors for Nitric Acid production

which was 13.7% higher than the corresponding data of the previous year. The most significant target countries of export were Austria, Germany, Italy, Yugoslavia, Bosnia-Herzegovina and Slovenia. In order to strengthen its presence in the foreign markets, the company founded a subsidiary in Serbia in 2003.

Hungarian fertilizer consumption is in line with the seasonal demand of the agricultural sector. 75-80% of the annual amount consumed is used in spring, while the rest is needed for the autumn. Nevertheless, production is carried out almost continuously at Nitrogénművek, paused only for a long summer break. The company's commercial network provides a sufficiently strong financial background and storage capacity to allow Nitrogénművek to maintain a large inventory outside the summer and fall seasons.

The relationship between Nitrogénművek and the authorised dealers belonging to the domestic fertilizer distribution network is regulated through long-term cooperation agreements. The company concludes monthly contracts for transportation, deposit, sales and storage within the scope of each cooperation agreement

The estimated market position of Nitrogénművek

Since accession to the European Union, the anti-dumping duty levied by the Community protects domestic Hungarian products from cheap eastern imports. Since it is a strategic objective for the European Union to sustain an acceptable level of agricultural production, and thus fertilizer production, the anti-dumping duty will ensure appropriate protection against cheap, imported fertilizers in the long run.

Nitrogénművek wishes to maintain its leading domestic market position through the maximum utilisation of its production capacity, a price policy tailored to market demand, the supply of high quality products, and the maintenance of its current distribution network. At present, Nitrogénművek has a 60% share in the domestic market of fertilizers, and its strategic aim is to reach and sustain a 65-70% market share in the long run.

To establish an optimal production structure, the company only exports a quantity that – over and above the amount distributed in the domestic market – can still be sold profitably in foreign markets. Nitrogénművek intends to keep the proportion of export revenues at around 20% of its total sales. The main target markets of foreign sales activity are the neighbouring countries, with gradually more emphasis placed on southeast European markets.

Table 5 shows the estimate of Hungarian fertilizer consumption included in the study prepared by the Agricultural Research and Information Institute (AKII). In order to keep our calculations conservative, we will use a forecast based on a pessimistic approach assuming unfavourable conditions for the sector.

Table 5: The estimated consumption of nitrogen-based fertilizers in Hungary until 2012 (thousand tonnes)

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
AN 34	515	524	534	545	555	566	582	600	618	636	656	675	695
Pétisó	81	82	84	85	87	89	91	94	97	100	103	106	109
Urea	82	84	85	87	89	90	93	96	99	102	105	108	111
Nitrosol	80	81	83	84	86	88	90	93	96	99	102	105	108

Source: AKII, Sectoral Economy Department

Hungarian agriculture is characterised by insufficient profitability at present, as a result of which producers are obliged to impose strict cost controls. Considering the fact that the cost of fertilizers accounts for a significant part (35-40%) of agricultural production costs, these cost cuts have a considerable effect on fertilizer consumption. After Hungary's accession to the European Union, the profitability of agriculture is expected to approach the EU level gradually. Thus, we can forecast a gradual development in fertilizer consumption.

1.4.5 Major contracts of Nitrogénművek

Natural gas supply

A consolidation process has taken place in the supplier market of Nitrogénművek in the past few years. The most important partner was natural gas supplier MOL Rt, which delivered 342.5 million m³ natural gas in 2003, with a total value of 12.46 billion HUF.⁵ The cost of natural gas accounted for 80% of the material costs of Nitrogénművek in 2003. Until 2003 natural gas could only be purchased at a fixed price from the supplier (the Gas Supply Branch of MOL Rt) specified by the relevant legislation. As of 1 January 2004, the natural gas market was opened and fuel can now be acquired under free market conditions. From 1 January 2004 about 80% of the natural gas demand of Nitrogénművek is satisfied from import and 20% from domestic sources. The stability of import supply is ensured by long-term agreements.

Agreement on electricity supply

Electricity represents the second largest item among material costs. In 2003 this accounted for 8.6% of material costs, with a total value of 1,333 million HUF. Since 1 January 2003 large consumers have been allowed to buy electricity in the free market, and the company has been purchasing electricity through MVM Partner Rt from supplier ÉDÁSZ Rt as of 1 April 2003.

Procurement

The other significant contracts concluded by the company are connected to raw materials and equipment. These include the purchase of precious metal catalyst grids necessary for the operation of the acid plant, to be delivered continuously throughout the year. Other components of significant value are usually purchased during the summer maintenance

⁵ MOL Rt also supplies Nitrogénművek with oil.

period. Nitrogénművek concludes skeleton agreements with regular material, machine and component suppliers, as well as specific agreements on individual orders.

Maintenance

Nitrogénművek enters into agreements on maintenance, refurbishment and investment projects continuously.

1.5 Introduction of the planned activity

Nitrogénművek plans to install a catalyst for reducing N₂O emissions at the same time as investing in a new acid plant. The N₂O reducing catalyst will be placed in the tail gas purification reactor building for this purpose. The planned technology is detailed in Section 2.3. The parameters before and after construction are summarised in the following table:

Table 6: The comparison of the main parameters of the existing and the new acid plants

		Existing plant	New plant
Technical parameters			
Pressure		Single pressure	Dual pressure
Tail gas reduction*		NSCR	SCR
N ₂ O reduction catalyst		no	yes
Equipment**		pneumatic	DCS
Capacity	t/day	4x350	1,500
Acid concentration	%	58	60
Pressure of steam output	bar	14	40
Specific material and energy consumption indicators			
Ammonia	kg/t	305	281
Cooling water	m ³ /t	200	129
Precious metal catalyst	mg/t	60	40
Electricity	kWh/t	26	11
Natural gas	Nm ³ /t	140	-
Steam output	t/h	1.4	0.6

*NSCR: Non-Selective Catalytic Reduction

SCR: Selective Catalytic Reduction

** DCS: Distributed Control System

2. TECHNOLOGY DESCRIPTION

2.1 Location of the Project

The exact location of the acid plant is Pétfürdő. The village is located at the south-eastern foot of the Bakony Mountains in Veszprém County. (see Figure 2).

Figure 3: Situation of Nitrogénművek



Nitrogénművek is composed of two production units: Site I was established in 1932, while Site II, situated south-east of Site I, was built between 1971 and 1975 (for the precise location of Nitrogénművek and the Project, see Appendix I).

The following facilities are located on the premises of Site I:

- Ammonium nitrate (AN) plant
- Argon plant
- Sorbite plant
- Dolomite plant

To the north of Site I are uncultivated lands, the Várpalota rubbish dump and composting plant, while the north-western area is covered by bushes and forests. The factory is bordered by the Budapest-Székesfehérvár railway line in the north. The so-called 'inner housing estate', some further parks, and sports facilities are to be found in the immediate neighbourhood of Site I, to the south-east. There are croplands and uncultivated areas on the undermined, subsided areas to the east of the factory.

The primary production facilities are located on the premises of Site II:

- Ammonia plant
- Nitric acid plant
- Urea plant
- "Pétisó" plant
- Delivery plant

Production support divisions are also at Site II:

- Desalination division
- SB XX electricity supply division

Various service units are to be found to the north of the factory, including maintenance workshops, warehouses, as well as the sites and rented areas of other companies. There are no residential areas within 500 meters of Site II.

2.2 Scope of activity

The planned activity involves the operation of an N₂O emissions reduction catalyst to be installed in the new acid plant, and the implementation of the technological modifications necessary for its construction and operation (enlarging the heat exchangers, building the reactor house, etc.).

2.3 Technology description

The following section deals with the formation of N₂O during acid production, as well as the opportunities for N₂O emissions reduction and the selected technology.

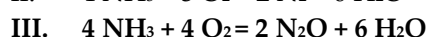
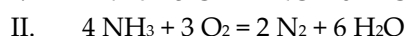
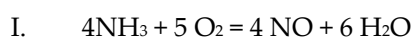
2.3.1 Acid production technology

The place of N₂O generation within the whole acid production process is shown below. The technology of acid production can be broken down into the following main steps:

- ammonia oxidation (combustion);
- absorption;
- tail gas purification.

The oxidation of ammonia and absorption can occur at low (1-3 bar), medium (4-7 bar) or high (8-12 bar) pressure. Low pressure and high pressure support oxidation and absorption, respectively. From a technological point of view, the technology is optimal if combustion occurs at low pressure and absorption at high pressure. This so-called dual pressure technology includes an intermediate compression between the two stages. The present acid plants of Nitrogénművek are of single pressure, where combustion and absorption occur at the same medium pressure of 5-6 bars.

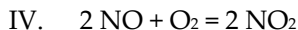
During the oxidation of ammonia, a 1:9 mixture of ammonia and air is driven through a catalyst, where the following reactions take place:



The reactions take place on a platinum catalyst at a temperature of 890 °C in a way that prevents subsidiary reactions II and III from occurring as much as possible, because these reactions have a negative effect on the rate of NO generation. Platinum may be alloyed with 5-10% rhodium to increase the life cycle of the catalyst and decrease its maintenance

costs.

The air further oxidizes the NO produced in reaction I.



The water absorption of NO₂ results in the generation of nitric acid:

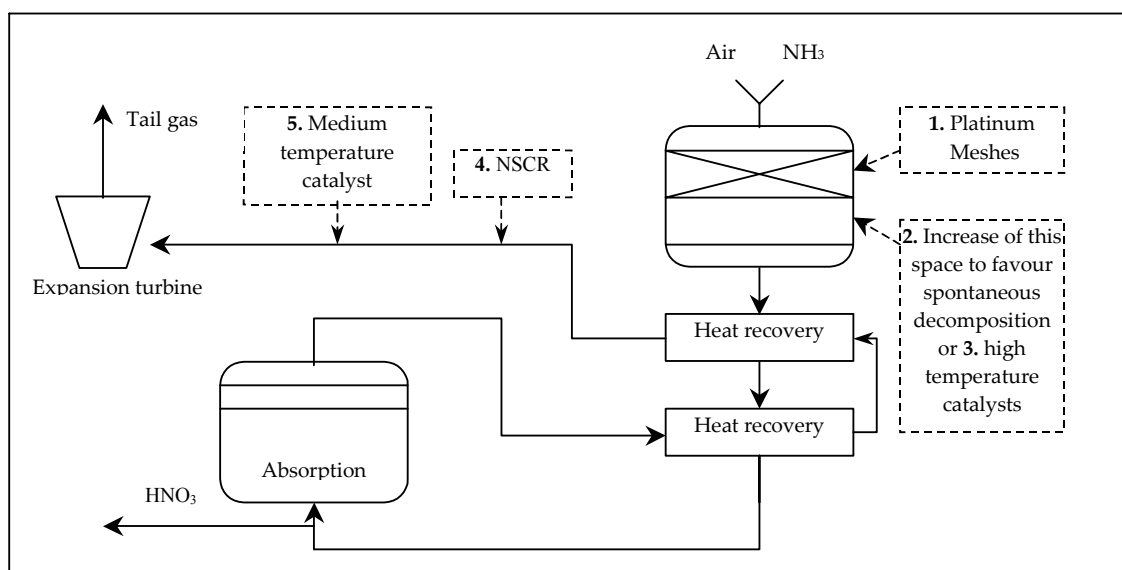


We can see that N₂O is generated by reaction III, which takes place in parallel with reactions I and II. There are two technologies for the catalytic decomposition of N₂O, both of which are rather new, and there are no significant industrial experiences in connection with the use of these catalysts.

2.3.2 N₂O reduction technologies

The methods suitable for reducing N₂O emissions during acid production are shown in the following figure:

Figure 4: N₂O emission reduction technologies⁶



The formation of N₂O is unavoidable in the course acid production, since the occurrence of side-reactions is an inevitable part of the first phase of ammonia production. Below we list some optional technologies for the reduction of N₂O:

- (1) A **geometrical transformation of the platinum gauze** would result in a higher NO level and/or lower N₂O formation. By means of this solution, an N₂O reduction of approximately 30% could be achieved. The method and type of transformation of the platinum gauze depends on specific circumstances.

⁶ Source: Integrated Pollution Prevention and Control, Seville, Spain 2004 March

- (2) The technology of **homogenous decomposition** was developed and patented by Norsk Hydro. This technology consists of an 'empty' reaction chamber of approx. 3.5 m extra length between the platinum gauze and the first heat exchanger. Due to longer residence time of 1-3 seconds, a N₂O reduction of 70-85 % can be obtained, since N₂O is unstable at higher temperatures and decomposes into nitrogen and oxygen.
- (3) **High temperature catalytic decomposition** developed for reducing N₂O emissions is a new technology, developed by firms such as the German BASF, the Norwegian Norsk Hydro and the French Grande Paroisse. This technology applies a new catalyst bed which is installed directly below the platinum gauze in the ammonium burner. The reaction takes place at around 850 °C. This new catalyst does not have any impacts on acid production (no NO loss occurs), but it results in a lower platinum consumption. This technology has been applied in some acid plants and has proven to be reliable. The technology developed by BASF has been used, for instance, in the nitric acid plant of Ludwigshaven, Germany, since 1999, where a N₂O reduction of 80-90% was achieved.
- (4) In the course of **non-selective catalytic reduction** (NSCR), hydrogen or hydrocarbon is burned in the tail gas over a platinum, rhodium or palladium catalyst, while N₂O and NO_x turn into elemental nitrogen. During the application of this technology, tail gases may need to be pre-heated, and the use of hydrocarbon fuel may incur the release of CO, CO₂ and hydrocarbons to the atmosphere. Conversely, the use of hydrogen is not possible if the ammonia plant is shut down, since – in this case – the synthesis gas necessary for the occurrence of the reaction is not available. A considerable advantage of this technology is that it is capable of reducing both N₂O and NO emissions at the same time.
- (5) Using a **combined N₂O and NO_x reduction reactor**, the amount of N₂O and – indirectly – NO_x can be decreased by the use of ammonia driven through the catalysts. The catalyst can be, for instance, platinum, vanadium pentoxide, or iron/chromium oxides on a zeolite or aluminium oxide catalyst carrier. Depending on the circumstances of the production process, the tail gas may need to be heated. This technology requires rather high temperatures (400°C) and is therefore not suitable for installation in many existing acid plants with low tail gas temperatures. The high performance catalyst does not result in other types of environmental pollution, and N₂O may even be reduced by 99% with its use⁷. At present two companies have made this technology available on a commercial basis: the German Uhde and the French Grande Paroisse.

2.3.3 The selected technology

The N₂O emissions reduction technology involving the geometrical transformation of the platinum gauze *in situ* (option 1 above) is not relevant for Nitrogénművek, because the

⁷ Agrolinz GmbH, EFMA presentation, May 2004

company will instead endeavour to minimise N₂O formation during the design and construction of the platinum gauze to be installed in the new acid plant.

With homogenous decomposition technology (2), which requires an extended reaction chamber, only a smaller N₂O reduction can be achieved than with the selected technology. According to the IPPC study, a 70% reduction may be realised with this technology.

The references concerning high-temperature decomposition (3) are available (mainly from BASF), but the experiences have shown so far that the first generation BASF catalysts, also including copper, can pose a risk to the post-catalytic processes and equipment. That is why BASF is working on the development of new, second generation catalysts.

The NSCR technology (4) was mainly used in acid plants that were built between 1971 and 1977. However, it is scarcely applied nowadays due to the high temperature requirement and high energy costs. NSCR is an expensive technology in terms of both investment and operational costs, operating at a high temperature puts great demands on the structural materials and also causes CO and CO₂ emissions.

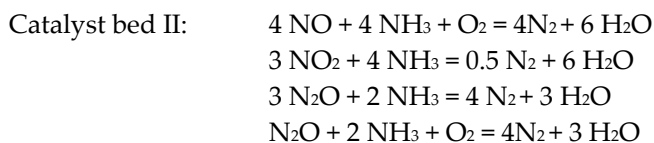
The Company has selected option (5) and is planning to install a combined N₂O and NO_x reduction catalyst in the new acid plant, since earlier industrial references are available for this catalyst type and at present the most efficient N₂O reduction can be achieved with this method.

The catalysts placed in the reactor are suitable for the reduction of both NO_x and N₂O at the same time. A N₂O reduction of 85-90% is expected to be reached by means of the selected technology. Since this technology will be installed in a new acid plant, the optimal situating circumstances can be taken into consideration even in the designing phase. Thus, the conditions necessary for the efficient operation of the catalyst can be guaranteed easily (e.g. bigger heat exchangers, ensuring the appropriate temperature of tail gas entering the catalyst).

The combined reactor will be installed between the last tail gas heat exchanger and the tail gas turbine. The reactor includes two catalyst layers with intermediate ammonia injection. The first catalyst layer decomposes N₂O into N₂ and O₂.

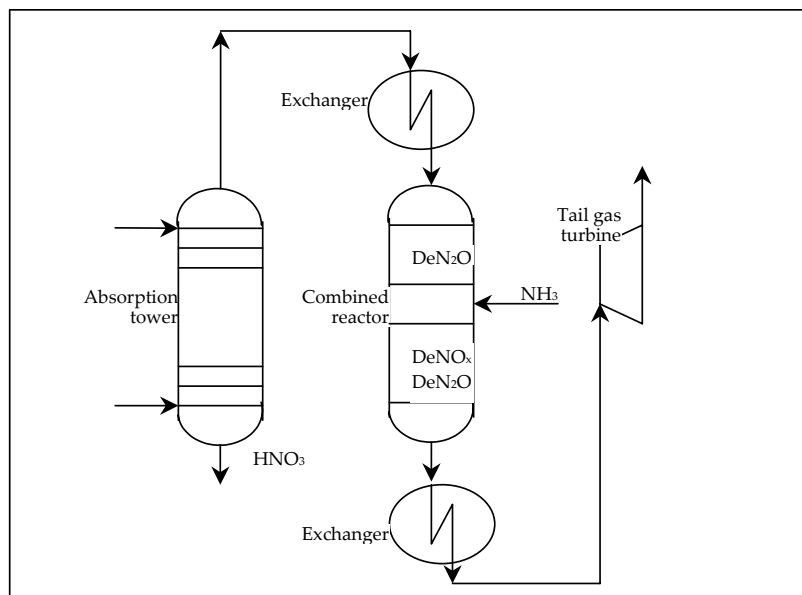
Catalyst bed I: $N_2O = N_2 + 0.5 O_2$

Leaving catalyst bed I, tail gas is mixed with ammonia before it flows to catalyst II. Ammonia decomposes NO_x into elemental nitrogen and water, besides the further reduction of N₂O.



The schematic diagram of the combined reactor is shown in Figure 5:

Figure 5: Combined N₂O and NO_x reduction reactor



According to plans, a minimum N₂O reduction of 85-90% can be achieved with this technology. Past experience shows that – under optimal operating conditions – a reduction of 99% can be achieved by increasing the catalyst surface and the amount of ammonia used. These parameters can be adjusted during operation with continuous monitoring of emissions. However, the amount of ammonia fed into the system is limited for environmental protection reasons, and it may not appear in the emitted gas. This requirement was taken into consideration during the specification of the plan values. The technology does not have an effect on NO formation.

During the construction of the new acid plant, Nitrogénművek will have the combined reactor installed (see the above paragraphs), but the supplier of the catalyst will only be selected right before commissioning, taking the references and results of the best available technologies into consideration. This is justified by the fact that catalytic technology is developing rather rapidly and research in progress continuously reveals fresh results. Nitrogénművek will monitor the latest research results and the efficiency of the technologies already applied in commercial production until the date of final decision and will consider these results in selecting a supplier.

Since the installation of the catalyst into the new acid plant will take around two weeks, Nitrogénművek is planning to carry out the installation process in the summer of 2006. The catalyst will be ready for operation by the launch of the acid plant in the autumn of

2006. The 2006 launch will leave enough time for the optimal setting of the equipment to achieve an appropriate level of N₂O reduction until the start of ERU delivery in 2008.

2.3.4 Short introduction of references

At present three companies supply the preferred catalytic technology: (1) the French Grande Paroisse, (2) the Norwegian Norsk Hydro and (3) the German Uhde.

(1) Grande Paroisse

Grande Paroisse is the largest fertilizer manufacturing plant in France and the second largest in Europe. It also deals with the production of fertilizer-related technologies and has been manufacturing NO_x emissions reduction SCR catalysts for acid plants for more than 20 years. The company's industrial know-how is based on a more than 50 years' experience supplemented by an extensive research programme. Grande Paroisse has experience building fertilizer manufacturing plants – and its constituent parts– equipped with its proprietary technology.

Grande Paroisse has recently developed a two-functional SCR catalyst for the reduction of both NO_x and N₂O. The related studies and research were completed in 1998-1999. The test run was conducted in the N7 acid plant of the Rouen fertilizer factory in 2000-2001. The catalyst was placed in the DeN₂O/DeNO_x reactor in the test run, its capacity was 500 Nm³/h and six catalysts of different composition were tried. The selective catalytic reduction of N₂O was tested with the addition of ammonia. The best reduction rates were achieved by the application of a catalyst of Fe-NaKAl₆Si₃₀O₇₂ composition. The results showed that the medium-temperature, double-function Grande Paroisse catalyst is capable of reducing N₂O emissions by 85-90%. Grande Paroisse does not yet have any commercial references for this technology.

(2) Norsk Hydro

Norsk Hydro is a multi-sector company with a strong profile in the aluminium and energy industries and has considerable experience in N₂O reduction processes. The technology of 'homogenous decomposition' applied in the first stage of the acid production process (see Figure 2(1)) was developed by Norsk Hydro. Under this process, the prolonged reaction time entails N₂O reductions in an extended reactor. The company possesses a high-temperature catalytic technology which has been used efficiently in sites such as Landskrona, Sweden. That plant has already terminated its production activity for reasons unrelated to this technology, but during the nine-month operation period, a permanent N₂O reduction of approximately 85-90% was achieved. The development of the above-mentioned combined N₂O and NO_x reduction reactor technology is in process at Norsk Hydro.

(3) Uhde GmbH

For decades Uhde has played a leading role in the fertilizer production industry and also in the design and construction activities related to fertilizer production. During its more than 80 years' experience, the company constructed over 360 fertilizer manufacturing

plants all over the world. Uhde has also developed a special combined reactor that is capable of the simultaneous reduction of both NO_x and N₂O. The technology developed by Uhde was first used in practice by Agrolinz Melamine International GmbH (AMI) in

the autumn of 2003. The type of the catalyst installed is FE-zeolite. The expected operating time of this catalyst is a minimum of 6 years.

This was the first combined DeN₂O/DeNO_x reactor in the world to be used in industrial practice. The historic data show that this technology outperformed initial projections: as compared to planned N₂O reduction of 90%, the technology has achieved an actual reduction of 99% through May 2004.⁸

Figure 6: Agrolinz acid plant



2.3.5 Implementation

2.3.5.1 Scheduling

Planned schedule		
One	Decision to constructing the new acid plant	January 2004
Two	Start of loan negotiations	January 2004
Three	Technical negotiations, visiting plants	March-May 2004
Four	Negotiations with potential suppliers	June-September 2004
Five	Selecting partner	October 2004
Six	Submitting preliminary loan application	June 2004
Seven	Indicative loan offer	August 2004
Eight	Contracting with foreign supplier	November 2004
Nine	Submitting final loan application	September 2004
Ten	Concluding loan agreement	October 2004
11	Getting soil mechanics expert opinion done	July 2004
12	Submitting application for construction permit	July 2004
13	Construction permit	September 2004
14	Construction	January 2005 - August 2006
15	Date of installation of the catalyst *	September 2006
16	Technical commissioning	October 2006
17	Pilot run	October 2006
18	Commissioning	October 2006

* The implementation depends on the company's participation in emissions trading.

⁸ EFMA presentations, AMI presentation, 2004.

The main phases of the Project implementation (planning, permitting, construction, commissioning) will be carried out in parallel with the acid plant investment, so the implementation plan shows the two investments simultaneously.

2.3.5.2 Permitting processes

The permitting of the new acid plant also involves obtaining permission for the N₂O catalyst. Therefore, the two investments are considered jointly.

Building permit

In the case of new infrastructure development, the application for the establishment and building permits must be submitted to the competent permitting authorities (the regional agency of the Hungarian Technical Safety Office, located in Székesfehérvár and the first instance Construction Authority). Although there is no need for a separate environmental permit in this case, the environmental regulatory body also participates in the permitting process, since the environmental plan chapter constitutes an integral part of the construction permit.

The building permit documentation can only be completed after making a decision on all the technical issues and the selection of the technology suppliers. The duration of the official procedure for awarding the building permit is theoretically 60 days, but this may be prolonged in the case of issues involving potentially complicated environmental consequences.

Environmental permit

For the reasons listed below, there is no need to obtain an environmental impact study for the implementation of the acid plant investment:

- no new activity is created from the investment;
- the investment does not qualify as a significant modification of the existing activity, since the capacity will not be expanded by at least 25%; no technology or product change will take place; no new emissions subject to emission caps will be generated; the emissions subject to emission caps, earlier permitted, will not increase by a minimum of 25%.

Utilisation permit

The competent technical safety and construction authority (augmented with the authorities such as the first instance fire protection authority) shall specify the conditions of the utilisation procedure of the building on the basis of the authorised plan.

Operation permit

Permitting operation falls within the competence of the operator itself, provided that it is not subject to any official permitting procedure by law. Prior to the commissioning of facilities, technologies, machines etc. that are deemed dangerous, an expert possessing

the appropriate labour safety qualifications must conduct a 'preliminary labour safety examination', on the basis of which the operator is allowed to authorise the operation of the facility. Naturally, this can only happen after the completion of the investment and a test run procedure.

Warranty

The agreements to be concluded with the main contractor and the supplier of the equipment will also include the terms of warranty.

3. BASELINE STUDY

The baseline study verifies the additionality of the Project, justifies the selection of the baseline, shows the limits of the system and outlines the method and calculations used to determine the emissions reduction.

3.1 Specification of the most likely baseline scenarios

3.1.1 Brief description of alternatives

The baseline question is: 'What would happen if Nitrogénművek did not invest in the Project, i.e. did not install the catalyst that reduces N₂O emissions?' The answer is that (i) the company could not achieve a N₂O emissions reduction of 85-90%; furthermore, there would be: (ii) lower investment costs, (iii) lower ammonia and energy consumption, and (iv) lower maintenance costs.

The construction of the acid plant and the implementation of the Project within it will happen simultaneously and will hence be closely interrelated. The estimated revenues from the sale of ERUs will considerably influence the financial returns of the new acid plant. For these reasons, we must consider the baseline issue in this broader context.

Nitrogénművek examined a number of development alternatives concerning the acid plant in order to evaluate future prospects. Out of these scenarios, detailed investment plans were made for four strategic alternatives:

- (1) Nothing will be done. The current state of the plant will remain unchanged except for maintenance, and the age of the (already outdated) acid production technology will rise above 35 years. Its useful operating time will decrease, as will financial returns from the facility as a whole.
- (2) Nitric acid production will be stopped, which involves closing the whole factory, since the elimination of this production process will also disable the other interrelated manufacturing activities. In this case, the Project cannot be implemented. The domestic demand for fertilizers will be satisfied from other N₂O emitting facilities outside Hungary.
- (3) A new acid production technology – *excluding* the installation of the catalyst capable of N₂O emissions reduction – will be implemented as a greenfield investment.
- (4) A new acid production technology – *including* the installation of the catalyst capable of N₂O emissions reduction – will be implemented as a greenfield investment. Theoretically, this may involve the implementation of six possible technologies listed in Section 2.3

Alternative (1), i.e. cancelling the construction of the new nitric acid plant, is *not* a likely alternative for the following reasons:

- The operability and technical condition of the existing acid plant could only be

sustained at higher and higher refurbishment and maintenance costs; the equipment will soon reach the end of its useful operating time.

- Due to the exponential increase in the acid plant's maintenance costs, the profitability of Nitrogénművek will continuously decrease, its revenues will drop owing to growing unreliability of equipment, and the marketability of products will be adversely affected.
- The plant can only continue its operation in the long run if its major equipment is replaced. This replacement will reach a total 70-80% of the costs of implementing a new acid production facility. However, the investments will not solve the problems of inefficient specific use of ammonia, too much low-pressure steam export, and excessive natural gas consumption.

Alternative (2) cannot be the baseline for the following reasons:

- According to the basic strategy of Nitrogénművek's owners, the company wishes to continue its fertilizer production activity and to sustain its leading position in the domestic market. This can only be achieved through continuous acid production.

We selected alternative (3), i.e. the construction of the new nitric acid plant without the N₂O emissions reduction technology, as the baseline for the following reasons:

- As the nitric acid plant, operating with a decreasing efficiency, high operating risks and growing maintenance costs, will have more and more problems in conforming to environmental regulations, the construction of a new acid plant is inevitable.
- In addition to being essential for the company's survival, the new nitric acid plant is also a core element of Nitrogénművek's strategic development plan, since it will decrease unit costs to a low level at which the products can become much more competitive than competing products from importers, and efficiency levels will also improve.
- Without climate protection objectives, the catalyst reducing N₂O emissions would not be installed, as this investment could not be justified on either economic or legal grounds.

Alternative (4) cannot be the baseline for the following reasons:

- The installation of the catalyst entails considerable extra costs as compared to alternative (3), and it also involves a technological risk.
- The modification of the platinum gauze is not a relevant alternative for Nitrogénművek, since a new plant will be constructed here with an optimal platinum gauze design already in place. The application of the technology of homogenous decomposition would require the installation of a larger, and thus, more expensive reaction chamber, which would also have an impact on the acid plant production (moreover, its efficiency is lower than that of the selected

technology). NSCR technology involves high energy costs, extra fuel consumption and high temperature requirements. Taking these circumstances into consideration, the application of a combined reactor was chosen.

- No laws oblige the company to curb its N₂O emissions, so the installation of the catalyst is voluntary.
- The NO_x reduction achieved by the combined reactor is a useful outcome of the processes, but it is not the main purpose of the equipment. Cheaper SCR instruments with many references and higher operational safety (e.g. less ammonia and energy consumption) are also available for such reduction.
- In the past five years, *none* of the new acid plants established in Europe have been equipped with a catalyst reducing N₂O emissions.

3.2 Justification of additionality

3.2.1 Issues concerning additionality

Regulatory considerations

Existing legislation

No existing domestic legislation in Hungary, or EU Directives which Hungary is scheduled to adopt, requires the reduction or elimination of N₂O emissions from the production of Nitric Acid. (See Section 7.4 for details.)

Expected legislation

At present, the Hungarian authorities are not planning to adopt any laws on N₂O emissions. The assumptions concerning the regulations are based on the following:

- An IPPC Directive which includes fertiliser plants in its scope may come into operation; nevertheless, it is not yet clear whether or not the Directive will actually include provisions prescribing the reduction of N₂O emissions,
- There is a BAT draft that lists some N₂O reduction technologies, but none of these technologies have been justified economically yet, and several questions concerning the technologies have remained unanswered. Therefore, we consider it unlikely that any of the technologies listed will be defined as BAT in the foreseeable future,
- It is possible that some time in the future technologies described in this BREF will be adopted as Best Available Technology and therefore be required under IPPC legislation. However, it is most likely that this requirement will relate to new or adapted plants, and therefore will not apply to the Nitrogénművek nitric acid plant, which is planned to be up and running by the end of 2006.

Economic considerations

If integrated into the new facility, the N₂O catalyst must be taken into consideration during the establishment of the new acid plant. It must be included in the design and construction stages (from the foundation to the technical equipment). Below we summarise the project-related changes and operational conditions that entail additional expenditure.

Table 7: Project-related changes and operational conditions

Investment
Building larger foundations
Oversized heat exchangers
Reactor and catalyst
Different operational unit as compared to the acid plant without a catalyst
Supplementary process analysis (N ₂ O emission measurement)
Larger-size and more complex DCS*
N ₂ O emissions measuring instruments
Operation
Higher ammonia consumption
Higher energy consumption
Periodic replacement of catalyst
Cost of continuous N ₂ O analysis
Higher maintenance cost

*Distributed Control System

Implementation of an N₂O reduction catalyst constitutes additional capital expenditure and operating costs without a corresponding increase in revenues (no effect on acid production) or reduction in material or energy costs. Therefore the catalyst project itself has a negative present value.

The capital costs of the Project amount to approx. EUR 1.5 million. Operating costs are approximately EUR 280,000 per year, which is mainly the cost of additional ammonia necessary for operation. The catalyst will have to be replaced once every four years, the cost of which is about EUR 600,000 per occasion. The total costs incurred are as follows:

Table 8: Estimated costs arising from the Project:

Type of cost	Cost
Investment (Euro)	1,500,000
Ammonia used (Euro/year)	280,000
Replacement of catalyst (Euro /replacement)	600,000
Operation (Euro /year)	80,000

Accordingly, the cashflow profile is as follows (in Euro).

Table 9: The cash flow and net present value of the project without carbon financing

Project only	2006	2007	2008	2009	2010	2011	2012	...	2030	2031
<i>figures in Euro</i>										
Capital investment	-1,500,000									
Ammonia cost		-280,000	-280,000	-280,000	-280,000	-280,000	-280,000	...	-280,000	-280,000
Catalyst change					-600,000				-600,000	
Maintaining costs		-80,000	-80,000	-80,000	-80,000	-80,000	-80,000	...	-80,000	-80,000
Total cashflows	-1,500,000	-360,000	-360,000	-360,000	-960,000	-360,000	-360,000	...	-960,000	-360,000
Discount factor	1.09	1.19	1.30	1.41	1.54	1.68	1.83	...	8.62	9.40
Discounted value	-1,376,147	-303,005	-277,986	-255,033	-623,934	-214,656	-196,932	...	-111,329	-38,301
Cost of capital	9%									
NPV	-5,788,668									

There is no economic benefit for implementing the Project in the absence of Joint Implementation finance, merely (as calculated in present value terms) a loss of EUR 5,788,668 assuming a 9% cost of capital.

Economic efficiency for various catalyst types

Several possible N₂O reduction technologies have been considered by experts. These range from those which have been widely applied in acid plants (e.g. BASF) to experimental models (e.g. Norsk Hydro, Grand Paroisse). Some of the technologies are more attractive economically than others, such as the high-temperature catalyst, which also results in less platinum consumption.

The selected technology has already been applied in the Agrolinz Plant. Because the catalyst is located in a separate, combined DeN₂O-DeNO_x reaction chamber, there is little risk of it interfering with the core process of acid production. Its disadvantage is that its operation requires considerable extra expenses.

Alternative technologies do exist which might be more attractive economically: the catalyst located in the reaction chamber operates at higher temperature and can enhance the efficiency of the core process, actually reducing operating costs. However the equipment is placed in the reaction chamber there is a strong risk that it could affect the core process, and further complicate a chemical process which is already hard to optimise (pressure, temperature adjustment, ammonia burning). Therefore the company is not ready to take this risk.

The baseline is therefore not to implement N₂O reduction technology. This alternative has zero cost, zero risk, and no demands on management time and resources.

3.2.2 Additionality tests

Below we consider the three additionality tests proposed in line with baseline methodologies of the CDM Board⁹:

- (1) There is an alternative project with superior financial results.
- (2) By means of carbon finance, the financial returns may be lifted above the investment threshold.
- (3) There are risks to the Project which require carbon finance to compensate for.

1. Alternative project with superior financial returns

In the absence of carbon finance the preferred alternative would be not to undertake the Project. Since there is no regulatory requirement to undertake the Project, this alternative is entirely realistic and indeed likely.

This alternative would incur no additional capital or operating costs.

The NPV of the Project's implementation is EUR -5,788,668 (see paragraph 3.2.1), while the alternative of not installing the N₂O reduction catalyst has a zero net present value.

In conclusion, the Project passes the test 1.

2. Carbon finance lifts the financial returns above the investment threshold

The Project passes test 2 since the carbon finance component transforms the Project from having negative to positive (and sufficient) NPV.

As explained above, the present value of the Project without carbon finance is negative. No IRR can be calculated since there is no positive return element in the cashflow projection. At a discount rate of 9%, the net present value is EUR -5,788,668.

The cashflows of the project with the sale of ERUs have a net present value of EUR 9,149,578, assuming a discount rate of 9%, as shown in the table below. This also assumes a 50% advance payment from the buyer and a price of EUR 5.5 per ERU:

⁹See: <http://cdm.unfccc.int/methodologies/approved> and <http://cdm.unfccc.int/methodologies/process?cases=A>

The cashflows of the Project including proceeds from the sale of ERUs are shown in the table below:

Table 10: The cash flow and net present value of the project with carbon financing

Cashflow with carbon	2006	2007	2008	2009	2010	2011	2012	2013	2014	...	2031
Emission reductions (tCO ₂ e)			775,267	802,677	785,579	805,902	808,674				
Emission reductions approved for transfer (tCO ₂ e)			697,740	722,410	707,022	725,312	727,806				
<i>figures in Euro</i>											
Advance payment	9,845,798										
Payments on delivery				1,918,786	1,986,626	1,944,309	1,994,609	2,001,467			
Capital investment	-1,500,000										
Ammonia cost		-280,000	-280,000	-280,000	-280,000	-280,000	-280,000	-280,000	-280,000	...	-280,000
Catalyst change					-600,000				-600,000	...	
Maintaining costs		-80,000	-80,000	-80,000	-80,000	-80,000	-80,000	-80,000	-80,000	...	-80,000
Total cashflows	8,345,798	-360,000	-360,000	1,558,786	1,026,626	1,584,309	1,634,609	1,641,467	-960,000	...	-360,000
Discount factor	1.09	1.19	1.30	1.41	1.54	1.68	1.83	1.99	2.17	...	9.39915792
Discounted value	7,656,695	-303,005	-277,986	1,104,283	667,237	944,672	894,187	823,797	-442,011	...	-38301.303
Cost of capital	9%										
Net present value		9,149,578									
Net present value without carbon financing		-5,788,668									
<i>Assumptions:</i>											
ERUs approved for transfer	90%										
Advance payment	50%										
Price in Euro	5.5										

Nitrogénművek will use a significant part of the amount raised through the sales of ERUs for the implementation of the Project and other (non-obligatory) environmental investments.

3. There are risks to the Project which require carbon finance to compensate for

Although there are some positive references available concerning the operation of the new technology, it may take several years until it reaches commercial maturity. It is not yet clear what impact this technology has on acid production and equipment in the case of unexpected events. Taking these circumstances into consideration, in spite of the previous positive results with the Project, the Company will be taking a risk by applying the selected technology.

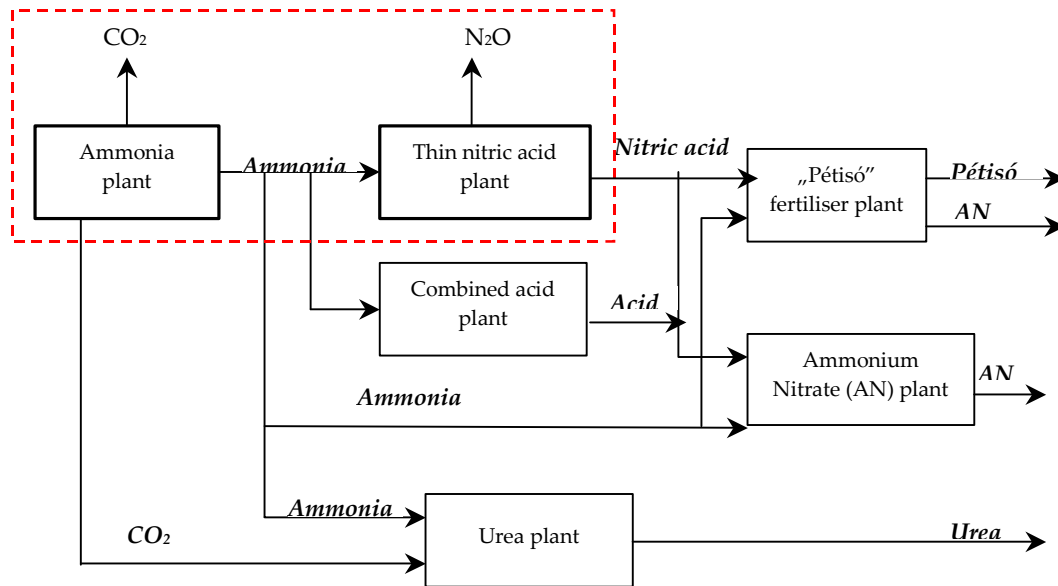
Consequently, the Project fulfils the requirements of test 3.

3.3 GHG sources and system boundaries

The boundaries of the system were determined by considering the processes in which any change in GHG emissions can be expected as a result of the Project.

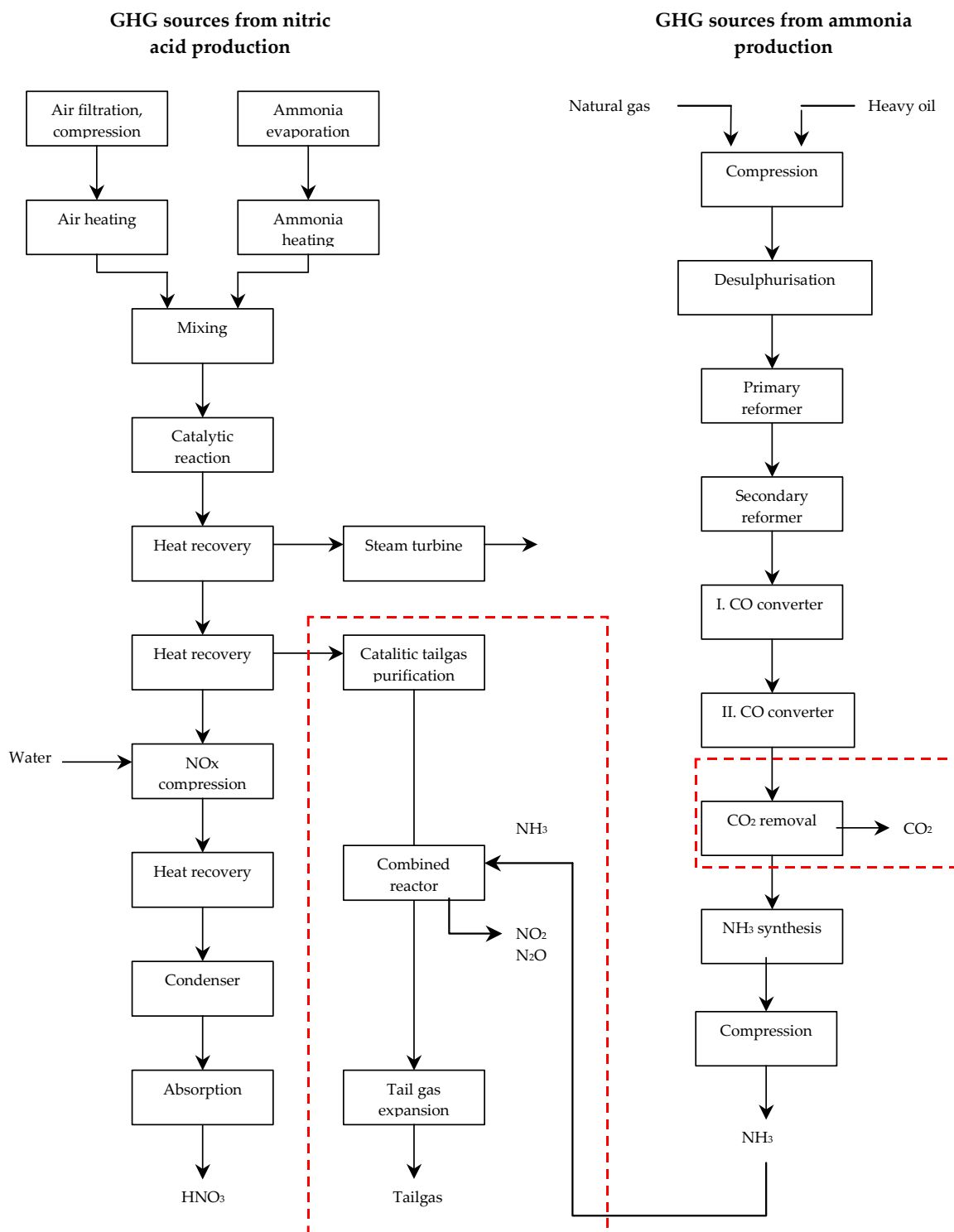
Figure 7 shows the Project emission boundaries in relation to the individual manufacturing processes of Nitrogénművek.

Figure 7: System boundaries in the manufacturing process of Nitrogénművek



The above figure illustrates that acid production and ammonia production necessary for the operation of the catalyst represent project-related GHG sources. The following figure details the GHG emission sources within these two manufacturing processes.

Figure 8: Boundary of the project in the process of nitric acid and ammonia production



Direct on-site emissions

N₂O emissions after the combined reactor placed in the tail gas purifier can be regarded as direct local emissions. The calculation of the quantity of N₂O released during direct local emissions is presented in Section 3.6.

Direct off-site emissions

No direct off-site emissions have been identified.

Indirect on-site emissions

CO₂ emissions occurring during gas washing in the course of the ammonia production necessary for the operation of the catalyst can be regarded as indirect on-site emissions. The quantity of CO₂ created during the production of the extra ammonia necessary for the catalyst can be specified from the natural gas related emissions of ammonia production. For detailed calculations see Section 3.6.

Since thin acid is also formed in the combined acid plant of Nitrogénművek, we examined how much the operation of the catalyst influences the GHG emissions related to combined acid plant production at the new acid plant. As a result, we can establish that the operation of the catalyst does not influence this production level, does not have an impact on thin acid production, and thus does not have an effect on its GHG emissions.

Indirect off-site emissions

GHG emissions during the production or the transportation of the catalyst itself can represent indirect off-site emissions related to the Project. As these emissions can be regarded as irrelevant (<1%) on the basis of the available information, they fall outside the scope of the Project boundaries.

3.4 Applied baseline method

3.4.1 Baseline calculation method

For the precise specification of the baseline emissions reduction, we need (i) the quantity of the nitric acid produced, (ii) the quantity of tail gas and (iii) the concentration of N₂O in the tail gas. From these data, the actual emissions can be calculated by the following formula:

Calculation of baseline N₂O emissions

$$Q_S = P_{\text{HNO}_3} \cdot Q_{\text{HNO}_3} / 1000$$

$$V_{\text{N}_2\text{O}} = Q_S \cdot C_{\text{N}_2\text{O}_A} / 100$$

$$F_{\text{N}_2\text{O}_A} = V_{\text{N}_2\text{O}} \cdot m / V_M$$

3.4.2 Project line calculation method

To specify precisely the project line and resultant emissions reductions, we need (i) the quantity of the nitric acid produced, (ii) the quantity of tail gas, (iii) the concentration of N₂O in the tail gas, and (iv) the quantity of ammonia used for the catalytic reaction. From these data, the actual emissions can be calculated by the following formulas.

Calculation of project line N₂O emissions

$$Q_S = P_{\text{HNO}_3} * Q_{\text{HNO}_3} / 1000$$

$$V_{\text{N}_2\text{O}} = Q_S * C_{\text{N}_2\text{O}_P} / 100$$

$$F_{\text{N}_2\text{O}_P} = V_{\text{N}_2\text{O}} * m / V_M$$

CO₂ emissions arising from the use of ammonia during the project

$$F_{\text{NH}_3} = ((F_{\text{HNO}_3} * 5 / 1000) * P_{\text{natural gas}}) * H_{\text{natural gas}} * E_{\text{natural gas}}$$

Emissions reduction in the first trading period

$$\text{Emissions reduction N}_2\text{O} = \sum_{2008}^{2012} F_{\text{N}_2\text{O}_A} - F_{\text{N}_2\text{O}_P}$$

$$\text{Emissions reduction CO}_{2\text{ekv}} = \sum_{2008}^{2012} \text{GWP} * (F_{\text{N}_2\text{O}_A} - F_{\text{N}_2\text{O}_P}) + F_{\text{NH}_3}$$

where:

Q _S	Quantity of tail gas	eNm ³ /year
P _{HNO₃}	Quantity of nitric acid produced	t/hour
Q _{HNO₃}	Quantity of tail gas per 1 tonne of nitric acid	Nm ³ /t
V _{N₂O}	Annual N ₂ O flow	eNm ³
C _{N₂O_A}	N ₂ O quantity in tail gas (baseline)	tf%
C _{N₂O_P}	N ₂ O quantity in tail gas (project line)	tf%
F _{N₂O_A}	Annual N ₂ O quantity (baseline)	tN ₂ O/year
F _{N₂O_P}	Annual N ₂ O quantity (project line)	tN ₂ O/year
M	Molecular weight of N ₂ O	G/mol
V _M	Molecular volume of N ₂ O (regular conditions)	dm ³ /mol
F _{NH₃}	CO ₂ emissions arising from the use of ammonia	t/year
F _{HNO₃}	Annual quantity of nitric acid	t/year
P _{natural gas}	Natural gas specific of ammonia	1082 gNm ³ /t NH ₃
H _{natural gas}	Average caloric value of natural gas	34,2 MJ/gNm ³
E _{natural gas}	Natural gas CO ₂ e emissions factor	tCO ₂ /MJ
GWP	N ₂ O Global Warm-up Effect	310 CO ₂ e

(i) Quantity of acid produced

The production of N₂O is a function of the output of the nitric acid plant. The baseline nitric acid production volumes are matched to the projected nitric acid production volumes in the project emissions calculation. The expected market growth can be forecasted on the basis of circumstances listed in Section 1.4.4. These volumes are set at relatively conservative levels. If larger volumes of nitric acid are actually produced, a higher number of ERUs will be generated. Conversely, lower volumes of production will generate fewer ERUs.

(ii) Quantity of tail gas

The quantity of tail gas for a given load is constant in the technology. The quantity of tail gas is a technological parameter which is specified in the current supplier's offer, later to be included among the technical specification of the contract. The estimated rate of tail gas emission is 205,000 Nm³/h.

(iii) N₂O concentration

The capacity and N₂O concentration values achieved by installation of the catalyst are guaranteed by the supplier. This volume is based on a conservative estimate, since the N₂O rate may be decreased by up to 99% depending on the quantity of ammonia fed into the system and through increasing the size of the catalyst (See Section 2.3.3 for details).

(iv) Amount of ammonia used

The volume of ammonia used is given by the supplier (as calculated at 5 kgNH₃/tHNO₃ specific).

3.4.3 Application of the method

We applied the calculation method shown in the section above to determine both the baseline and the project line emissions. The difference only lies in the inclusion of CO₂ emissions arising from the production of ammonia used, since this need not be considered in the baseline.

3.5 Baseline emissions

3.5.1 Baseline estimation methodology

In order to determine the baseline emissions, we considered a N₂O concentration of 1000 ppm in the tail gas, resulting in a N₂O emission of 6.28 kg per 1 tonne of acid produced (for detailed calculations see Section 3.5.2). These values were determined by using the following references:

- a) The new acid plant will be constructed based on the licence of either Grande Paroisse or Uhde. In each case, the average emissions without a catalyst is 1000 ppm. This value was determined pursuant to the data supplied by the acid plant supplier and the Linz plant, respectively.
- b) The IPPC reference document specifies a rather wide range of N₂O concentration in the tail gas (30-1700 ppm) for individual nitric acid plants. This wide range is justified by the fact that the quantity of N₂O formed during acid production largely depends on the quality and operational circumstances of the NO catalyst

used in the oxidation chamber¹⁰. These values are not detailed in the document (origin of data, type of acid plant, age of acid plant etc.), and it is therefore very difficult to compare them with the estimated values of the Project.

- c) Currently 15 nitric acid plants operate in France, of which 9 are owned by Grande Paroisse. The total annual production of the 15 plants was 2,382,014 t 100% nitric acid in 2002, and their N₂O emissions for the same year amounted to 17,367 tonnes¹¹. Based on these values, the average N₂O emission of acid plants was 7.29 kg N₂O per 1 tonne 100% acid.
- d) Furthermore, we examined the N₂O emissions of three new acid plants built in Europe in the past five years for the purposes of checking the reliability of the baseline data. Two plants out of the three were built based on the licence of Grande Paroisse in (1) Cologne, Germany and (2) Duslo, Slovakia, while the third was established on the basis of Uhde's technology in Lovosice, in the Czech Republic. No N₂O abatement technology operates in any of these facilities at present. Only the Czech acid plant uses the Grande Paroisse technology that will also be introduced in the new acid plant of Nitrogénművek. The emission of the plant is 7 kg N₂O per 1 tonne of 100% acid. This matches closely the figure derived above (c).

According to the above-mentioned sources, the following table summarises the N₂O values formed during modern, double-pressure acid production technology.

Table 11: Specific N₂O emissions of plants operating with technologies similar to the new acid plant

Source	N ₂ O concentration	Specific
Agrolinz 1)	1,000 ppm	kgN ₂ O/tHNO ₃
Acid plants in Austria 2)	1,200-2,750 ppm	
Köln acid plant (Germany) 3)	2,200-3,000 ppm	
Lavosice acid plant (Czech Republic) 4)	1,000-1,500 ppm	
Duslo acid plant(Slovakia) 5)	1,000-1,500 ppm	
BASF 6)	1,000 ppm	
BAT 7)	300-1,700 ppm	
Acid plants in France 8)		7.29 kgN ₂ O/tHNO ₃
IPCC 9)		8-10 kgN ₂ O/tHNO ₃

1) Agrolinz, EFMA seminar, May 2004

2) Wiesenberger H.: State-of -the-art for the production of nitric acid with regard to the IPPC directive, Wien

3) Köln nitric acid plant

4) Lavosice nitric acid plant

5) Duslo nitric acid plant

6) BASF, EFMA seminar, May 2004

7) Integrated Pollution Prevention and Control, March 2004.

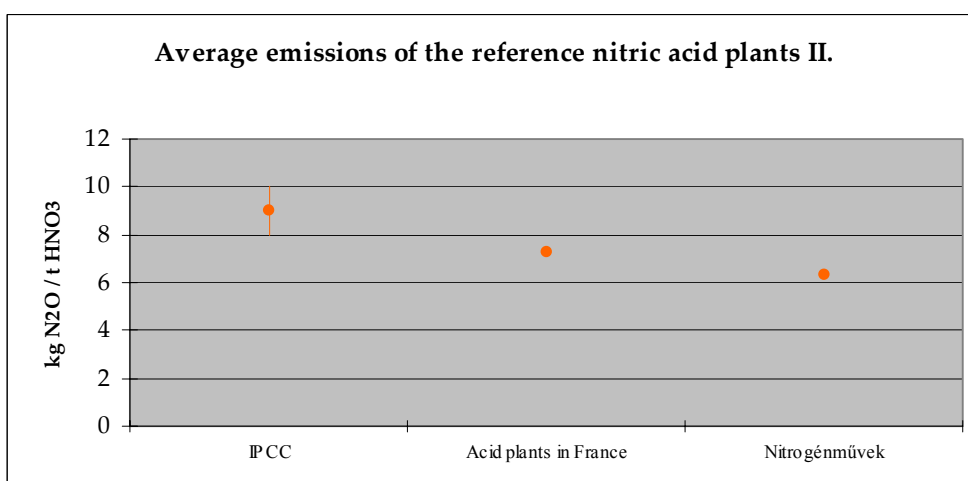
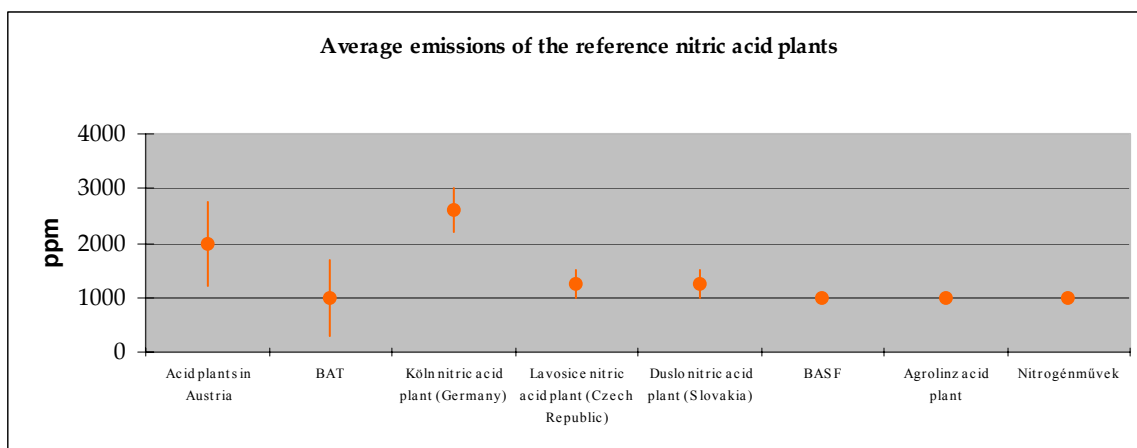
8) Ministry for Ecology and Sustainable Development, ADEME, 2004 France

9) IPCC Good practice Guidance and Uncertainty Management, 2001

Note: 7 kg N₂O emission means approx 1,100 ppm concentration per each tone of nitric acid produced.

¹⁰ Integrated Pollution Prevention and Control, p.37, March 2004, Seville

¹¹ Nitrogen oxides and N₂O emissions from nitric acid workshops, Ministry for Ecology and Sustainable Development, ADEME, 2004 France



Comparing these values, it can be seen that the N₂O emissions value of 1000 ppm we use as the basis for baseline calculations (6.28 kg N₂O/tHNO₃) is a conservative estimate.

3.5.2 Calculation of baseline emissions

The baseline emission is based on construction of the new nitric acid plant without the N₂O emissions reduction technology, in accordance with reasons detailed in Section 3.1.

The estimated baseline N₂O emissions are shown in the following table.

Table 12: Baseline emissions

Baseline: establishment of a new acid plant without a catalyst	2004	2005	2006	New acid plant 2007	FIRST TRADING PERIOD					
					2008	2009	2010	2011	2012	
Capacity	t/day	1,400	1,400	1,400	1,500	1,500	1,500	1,500	1,500	1,500
Annual acid quantity	t/year	376,523	381,210	375,248	425,265	471,239	487,900	477,507	489,861	491,545
Annual operating time	day	269	272	268	284	314	325	318	327	328
Quantity of acid produced (planned)	t/h	58.33	58.33	58.3	62.5	62.5	62.5	62.5	62.5	62.5
Quantity of tail gas per one ton of acid	Nm ³ /t	4,800	4,800	4,800	3,200	3,200	3,200	3,200	3,200	3,200
Quantity of tail gas	thNm ³ /year	1,807,312	1,829,808	1,801,190	1,360,848	1,507,965	1,561,281	1,528,024	1,567,554	1,572,944
N ₂ O quantity in tail gas (planned)	ppmv	1,370	1,370	1,370	1,000	1,000	1,000	1,000	1,000	1,000
N ₂ O quantity in tail gas	tf%	0.137	0.137	0.137	0.10	0.10	0.10	0.10	0.10	0.10
Annual N ₂ O flow, volume	thNm ³	2,476.02	2,506.84	2,467.63	1,360.85	1,507.97	1,561.28	1,528.02	1,567.55	1,572.94
Annual N ₂ O amount	tN ₂ O/year	4,861	4,922	4,845	2,672	2,961	3,065	3,000	3,078	3,088
N ₂ O emission factor	CO ₂ e	310	310	310	310.0	310.0	310	310	310	310
Annual CO ₂ e emission	tCO ₂ e/year	1,507,045	1,525,804	1,501,940	828,289	917,834	950,284	930,042	954,102	957,383

*Guaranteed by the technology licensor

On the basis of the specifications provided by the supplier, the plant will emit 6-6.5 kg of N₂O per each tonne of nitric acid produced.

Table 13: Specific baseline N₂O emissions per 1 tonne of acid

Baseline: Installation of the new nitric acid plant without catalyst	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Annual acid production	t/year	376,523	381,210	375,248	425,265	471,239	487,900	477,507	489,861	491,545
Annual N ₂ O amount	tN ₂ O/year	4,861	4,922	4,845	2,672	2,961	3,065	3,000	3,078	3,088
N ₂ O emission per 1 tonne of 100% nitric acid	kgN ₂ O/tHNO ₃	12.91	12.91	12.91	6.28	6.28	6.28	6.28	6.28	6.28

Nitrogénművek assumes a growing volume of acid production, which means that annual production will be increased from 376 thousand tonnes in 2004 to 491 thousand tonnes by 2012. The volume of tail gas per 1 tonne of acid was 4,800 Nm³/t in the old plants, while this value will drop to 3,200 Nm³/t in the new plant. The average N₂O concentration in the tail gas is currently 1,370 –1,580 ppm, while this value would be 1,000 ppm in the new plant without the N₂O catalyst. The latter is a guaranteed average value calculated by the designer in a conservative way (for the information supporting this value, see Section 3.5). In accordance with the baseline assumption, N₂O emissions will reach about 3,000 t per annum, which equals to 900-950 thousand CO₂eq as calculated by a N₂O GWP factor of 310.

3.6 Project line emissions

The test run of the acid plant is expected to be conducted in October 2006. In the first few months the optimal operational parameters of the plant will be adjusted. Therefore, Nitrogénművek will only have analysable, reliable information about the catalyst's operation a few months after that. Consequently, the emissions reduction will only be calculated from January 2007.

The estimated N₂O emissions values concerning the operation of the new acid plant equipped with a N₂O catalyst are summarised in the table below. The volume of the acid produced and the concentration of N₂O were specified on the basis of Section 3.4.1.

Table 14: Project line emissions

Project line: establishment of a new acid plant with a catalyst	2004	2005	2006	New acid plant						
				2007	FIRST TRADING PERIOD					
				2007	2008	2009	2010	2011	2012	
Capacity	t/day	1400	1400	1400	1500	1500	1500	1500	1500	1500
Annual acid quantity (planned)	t/year	376,523	381,210	375,248	425,265	471,239	487,900	477,507	489,861	491,545
Annual operating time	day	269	272	268	284	314	325	318	327	328
Quantity of acid produced	t/h	58.33	58.33	58.3	62.5	62.5	62.5	62.5	62.5	62.5
Quantity of tail gas per one ton of acid	Nm ³ /t	4800	4800	4800	3200	3200	3200	3200	3200	3200
Quantity of tail gas	thNm ³ /year	1,807,312	1,829,808	1,801,190	1,360,848	1,507,965	1,561,281	1,528,024	1,567,554	1,572,944
N ₂ O quantity in tail gas (planned)*	ppmv	1370	1370	1370	150	150	150	150	150	150
N ₂ O quantity in tail gas	tf%	0.137	0.137	0.137	0.015	0.015	0.015	0.015	0.015	0.015
Annual N ₂ O flow, volume	thNm ³	2476.0	2506.8	2467.6	204.1	226.2	234.2	229.2	235.1	235.9
Annual N ₂ O amount	tN ₂ O/year	4861	4922	4845	401	444	460	450	462	463
N ₂ O emission factor	CO ₂ e	310	310	310	310.0	310	310	310	310	310
Annual CO₂e emission	tCO₂e/year	1,507,045	1,525,804	1,501,940	124,243	137,675	142,543	139,506	143,115	143,607
Ammonia need of the catalyst**	t				2126	2,356	2,440	2,388	2,449	2,458
Ammonia specific of the natural gas	gNm ³ /t NH ₃				1082	1082	1082	1082	1082	1082
Used amount of natural gas	gNm ³				2,300,683	2,549,404	2,639,540	2,583,315	2,650,146	2,659,258
Average heating volume of the natural gas	MJ/gNm ³				34.2	34.2	34.2	34.2	34.2	34.2
Heating volume of the used natural gas	TJ				78.68	87.19	90.27	88.35	90.63	90.95
CO ₂ e emission factor of the natural gas	tCO ₂ /MJ				56.1	56.1	56.1	56.1	56.1	56.1
Annual CO₂ emission from ammonia production	tCO₂				4,414	4,891	5,064	4,956	5,085	5,107
Annual total CO₂e emission	tCO₂e/year	1,507,045	1,525,804	1,501,940	128,658	142,566	147,607	144,463	148,200	148,710

*Guaranteed by the technology licensor

** 5kg NH₃/tHNO₃

Based on the specifications of the manufacturer, the plant will emit approx. 1 kg N₂O per each tonne of nitric acid produced.

Table 15: Specific project line N₂O emissions per 1 tonne of acid

Project line: Installation of the new acid plant with catalyst	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Annual acid production	t/year	376,523	381,210	375,248	425,265	471,239	487,900	477,507	489,861	491,545
Annual N ₂ O amount	tN ₂ O/year	4,861	4,922	4,845	401	444	460	450	462	463
N ₂ O emission per 1 tonne of 100% nitric acid	kgN ₂ O/tHNO ₃	12.91	12.91	12.91	0.94	0.94	0.94	0.94	0.94	0.94

The acid production and tail gas volume data considered for the baseline were used to determine project line emissions. According to a conservative approach, the N₂O content of the tail gas will be 150 ppm, as calculated with a reduction rate of 85%. Using the above figures, N₂O emission will range from 400 to 465 tonnes per year as a function of acid production in the period of 2008-2012, which equals 120-150 thousand tonnes of CO₂eq emissions. Apart from this, further CO₂ emissions will arise from the ammonia used for the operation of the catalyst. The annual ammonia consumption will range between 2000 and 2500 tonnes. On the basis of an average natural gas caloric value of 34.2 MJ/gNm³, the resulting emissions will reach about 4000-5000 tonnes of CO₂.

3.7 Emissions reduction

The N₂O emissions reduction arising from the project line and the baseline emissions in the first trading period is summarised in the following table (given in CO₂eq).

Table 16: Emissions reduction in the first trading period

Emission reduction		2004	2005	2006	New acid plant		FIRST TRADING PERIOD			
					2007	2008	2009	2010	2011	2012
Baseline	tN ₂ O/year	4,861	4,922	4,845	2,672	2,961	3,065	3,000	3,078	3,088
Projectline	tN ₂ O/year	4,861	4,922	4,845	401	444	460	450	462	463
Emission reduction	tN ₂ O/year	0	0	0	2,271	2,517	2,606	2,550	2,616	2,625
Total emission reduction 2008 - 2012		tN₂O		12,914						

Emission reduction		2004	2005	2006	New acid plant		FIRST TRADING PERIOD			
					2007	2008	2009	2010	2011	2012
Baseline	tCO ₂ e/year	1,507,045	1,525,804	1,501,940	828,289	917,834	950,284	930,042	954,102	957,383
Projectline	tCO ₂ e/year	1,507,045	1,525,804	1,501,940	128,658	142,566	147,607	144,463	148,200	148,710
Emission reduction	tCO ₂ e/year	0	0	0	699,632	775,267	802,677	785,579	805,902	808,674
Total emission reduction 2008 - 2012		tCO₂e		3,978,100						

The estimated volume of emissions reduction in the 2008-2012 period is approximately **12,900 tonnes of N₂O** and there is an extra 25,000 tonnes of CO₂ emission from ammonia consumption. The total emission reduction corresponds to a total **4,000,000 tonnes of CO₂e**.

3.8 Uncertainties

In the baseline, most uncertainties are caused by the volume of acid production and N₂O concentration. In the project line, these factors are compounded by uncertainty over the required quantity of extra ammonia. In order to reduce these risks, Vertis used conservative values for the calculations, leaving considerable reserves in each area of uncertainty. This data will be rendered more precise in accordance with the monitoring plan and data supply detailed in Section 4 before delivery of ERUs begins.

4. MONITORING AND REPORTING PLAN

4.1 Aim of the monitoring plan

The aim of the monitoring plan is to provide a practical framework for the collection and processing of data through which the GHG emissions reduction generated by the project can be monitored and verified.

4.2 Requirements concerning the monitoring activity

The monitoring of the N₂O emissions reduction achieved by the project will be based on the data collected in the new Nitrogénművek acid plant. On the basis of the Monitoring Report, the N₂O emissions arising from the project and the baseline can be checked. The validity and reliability of the data recorded and calculated is approved annually by a third party.

The monitoring activity will be carried out by specially trained Nitrogénművek staff.

After verification, the results of monitoring should give sufficient information for the organisation approving ERUs on the transparency and reliability of the data.

4.3 Measurement of major parameters

4.3.1 Measurement of nitric acid produced

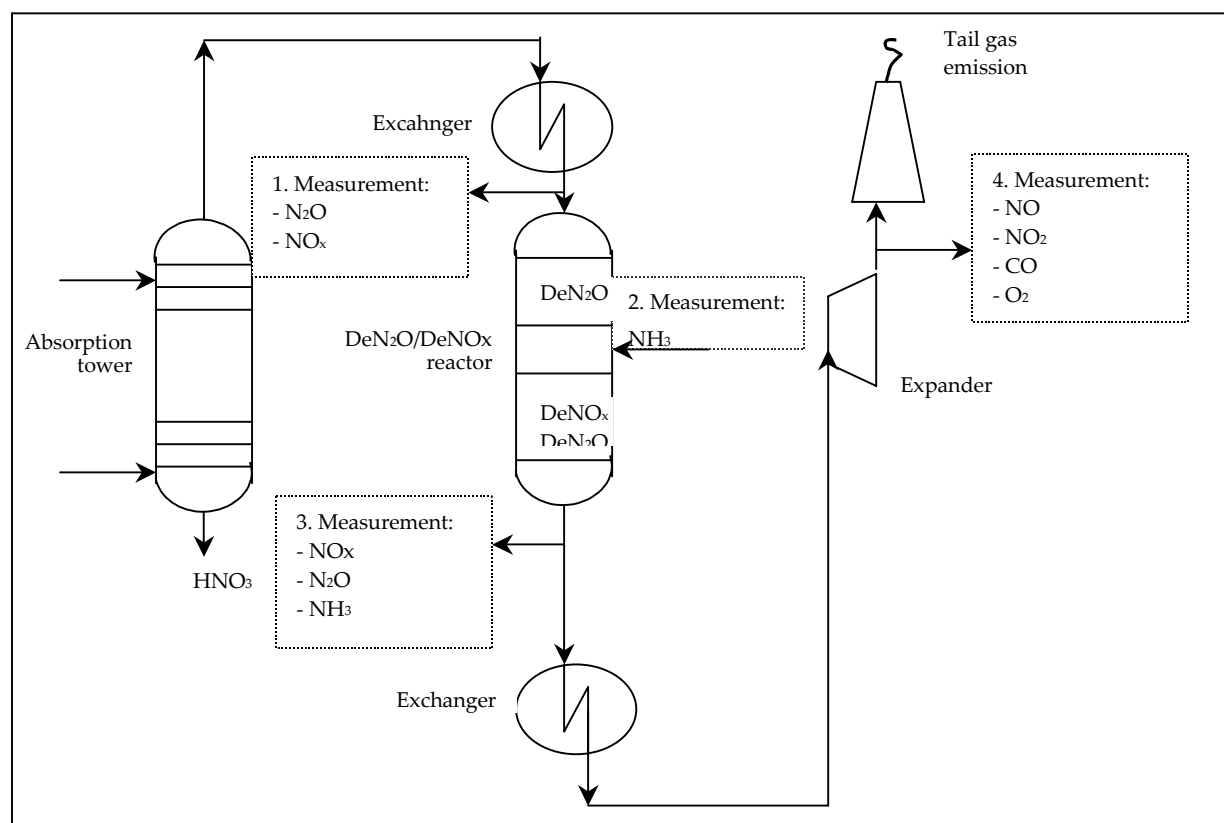
The monitoring of the volume of nitric acid produced will be carried out by means of a flow meter. The error margin of the instrument is below 0.1%. The equipment will be installed after the bleaching tower. The data will be archived in a computer database.

4.3.2 Emissions measurement

Since only limited industrial-scale references and results concerning the selected N₂O emissions reduction technology were available when the present document was prepared, the actual emissions reduction can only be specified after continuous, verified data lines are available. Taking this into consideration, the monitoring of N₂O emissions achieved during both the baseline and the project line are essential for determining the actual emissions reduction.

The tail gas measuring instrument will be installed at three places (see Figure 4).

Figure 9: Monitoring measurement points to follow emissions reduction



1. Before the combined reactor. The gases to be measured here include NO, NO₂ and N₂O.
2. Measurement of ammonia where it enters the system.
3. Between the catalytic reactor and the tail gas turbine. The instrument will measure the NO, NO₂, N₂O and NH₃ content of the tail gas.
4. The third measuring instrument placed right before the chimney will be installed to provide data for the environmental authorities. This will give information on the NO, NO₂, N₂O, CO and O₂ content of the tail gas.

In each case, the measurement results will be recorded electronically, then this data will be processed and analysed by a central computer system (Distributed Control System – “DSC”).

Several manufacturers produce instruments for the purposes of analysing gases contained in the tail gas. At present the most likely suppliers of instruments necessary for monitoring are as follows¹²: Horiba, Hartman & Braun-ABB, Emerson Process Management, Yamatake, Nicollete and Fintech. The DSC suppliers can be chosen from: Emerson Process Management, Honeywell Experion or Yokogawa.

¹² Source: Supplier’s offer

Since the Agrolinz plant, possessing the selected technology (see Section 2.3.3.) uses the best currently available technology supplied by ABB, and its experiences have been positive so far, it is very likely that Nitrogénművek will also apply the same equipment. Apart from gas chemistry technologies, ABB's scope of activity also includes the energy sector, industrial automation, oil and petrochemical technologies. The ABB Group is present in about 100 countries of the world, and has considerable experience in engineering and technological activities in the areas listed above.

ABB applies an Advance Optima Uras 14 type instrument, operated by infrared absorption technology. The equipment is capable of the simultaneous and continuous measurement of 4 components. Besides N₂O, the typically measured components can include CO, CO₂, NO, and SO₂. A high level of sensitivity and a wide range of measuring limits characterise the equipment. It measures the N₂O concentration of the tail gas with 1% uncertainty. The suppliers undertake warranty for the operation of the instrument.

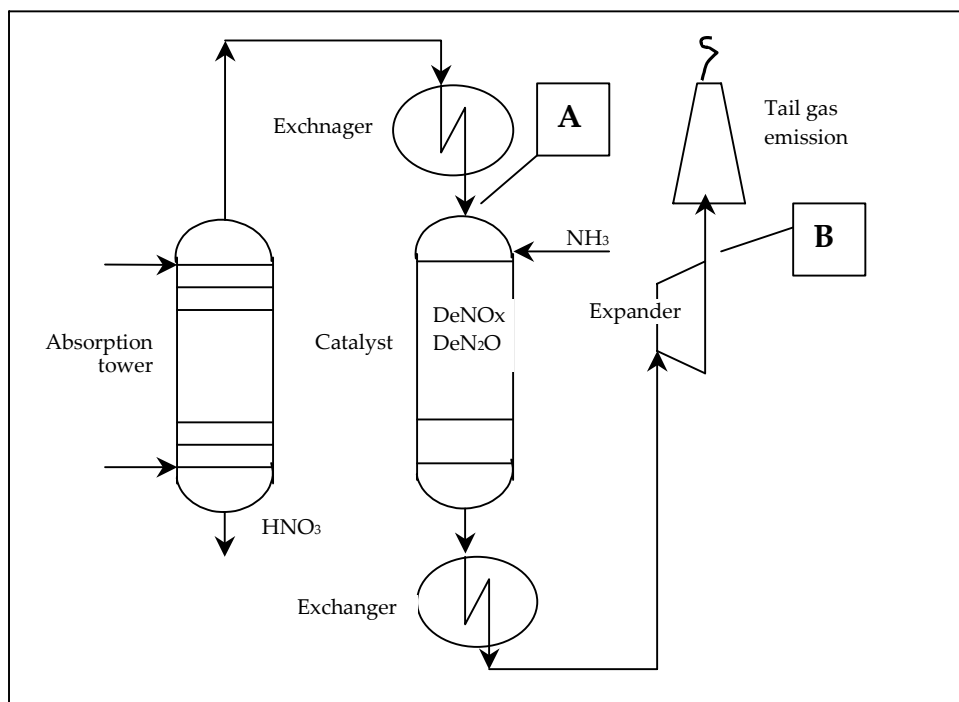
The technical parameters of the Advance Optima Uras 14 model are as follows:

Parameter	Sensitivity
Linearity deviation	≤ 1 % of span
Reproducibility	≤ 0.5 % of span
Zero-point Drift	≤ 1 % of span per week
Sensitivity	≤ 1 % of span
Detection limit	≤ 0.5 % of span

4.3.2.1 Measurement of baseline N₂O concentration

The exact knowledge of baseline N₂O concentration is needed for specifying baseline emissions. Since the baseline represents the N₂O emissions of the new acid plant without a catalyst, an instrument placed before the N₂O reducing catalyst will measure the N₂O concentration generated by the acid plant. Here the N₂O content of the tail gas equals the volume of N₂O generated by the burning of ammonia during acid production, and this volume would be emitted without the use of the catalyst. So the values measured at this place will provide the most precise data for the determination of baseline emissions. The N₂O measuring instrument will measure the data continuously, as detailed above. The data will be stored on a central server.

Figure 10: Baseline N₂O measurement



In the above figure, letter 'A' denotes the baseline emission value that would occur after the burning of ammonia in the new acid plant. 'B' stands for the N₂O concentration that could be measured in the tail gas after the NO_x catalyst and the tail gas turbine without the installation of the N₂O catalyst. As the NO_x catalyst would not influence N₂O emissions, A=B. Thus, the data measured at point 1 (see Figure 2) can be applied for the baseline calculations.

4.3.2.2 Measurement of project line N₂O concentration

The exact knowledge of N₂O concentration achieved with the use of the catalyst is needed for specifying project line emissions. For this purpose, a measuring instrument will be placed after the catalyst, where the values will be measured continuously. The measured results will appear in the central control unit.

Nitrogénművek will perform additional control measurements for determining both the project line and the baseline. Apart from the centrally controlled on-line monitoring, regular, quarterly, manual, analytical measurements will also be carried out for the supervision of on-line data. The gas obtained by sampling can be analysed by a FTIR gas analysing instrument.

4.3.2.3 Measurement of the ammonia used

Ammonia will be injected to the combined reactor between the N₂O and the NO_x catalysts. The measurement of ammonia consumption will be controlled centrally at points shown in

Figure 9. The ammonia measurement is necessary because the volume of ammonia fed into the system must be reduced if it appears in the tail gas. A DSC system analyses the measured results and adjusts the volume injected in order to achieve an optimal N₂O reduction.

4.3.2.4 Determining the volume of tail gas

The calculation method is based on the fact that the nitrogen content of air fed into the system for combustion purposes goes through the production process and leaves the plant through the tail gas chimney in an unchanged form and volume. The volume of nitrogen passing through the plant can be specified by measuring the volume of air fed into the system, out of which the volume of tail gas may be established as follows, by measuring the composition of tail gas:

$$Q_N = V_1 * C_N$$

$$Q_T = Q_N / C_T$$

Where:

Q _N	volume of nitrogen	Nm ³ /h
V ₁	volume of air measured	Nm ³ /h
C _N	mole fraction of nitrogen in air	tf%/100
Q _T	volume of tail gas	Nm ³ /h
C _T	mole fraction of nitrogen in tail gas	tf%/100

An installed quantity meter, whose accuracy is above 99.9 %, continuously measures the volume of air. The concentration of nitrogen (thus, its mole fraction) in air can be regarded as constant.

The above calculation may be corrected by the volume of nitrogen arising from the reduction of nitrogen-oxides. This volume can be established from the difference in concentrations emitted from the absorber and those measured in the chimney. Nevertheless, this correction has only a minor impact (0.5%) on the calculation of tail gas quantity.

4.4 Calculation of CO₂eq emissions reduction during monitoring

The monitoring plan uses the results of the on-line tail gas analysis for determining emissions reductions. Both the baseline and the project line emissions are based on the actual emission concentrations measured by electronic methods. Of this, the actual emissions reduction can be calculated by the following formulas:

Baseline N₂O emissions:

$$Q_S = P_{HNO_3} * Q_{HNO_3} / 1000$$

$$V_{N_2O} = Q_S * C_{N_2O} / 100$$

$$F_{N_2O_A} = V_{N_2O} * m / V_M$$

Project line N₂O emissions

$$Q_S = P_{HNO_3} * Q_{tHNO_3} / 1000$$

$$V_{N_2O} = Q_S * C_{N_2O} / 100$$

$$F_{N_2O_P} = V_{N_2O} * m / V_M$$

CO₂ emissions from the use of ammonia:

$$F_{NH_3} = ((F_{HNO_3} * 5 / 1000) * P_{natural\ gas}) * H_{natural\ gas} * E_{natural\ gas}$$

Emissions reduction:

$$ERU: GWP * (F_{N_2O_A} - F_{N_2O_P}) + F_{NH_3}$$

The parameters contained in the formulas are specified in Section 3.4.1.

4.5 Measurement accuracy

The accurate specification of emissions and emissions reduction are based on four fundamental values: (i) nitric acid sales, (ii) volume of tail gas, (iii) N₂O concentration and (iv) the volume of ammonia used. The errors related to the measurement of these parameters must be analysed to discover how much they influence the amount of emissions.

Table 17: Measured parameters and their accuracy

#	Parameter	Note	Uncertainties arising from measurement
1	Nitric acid production	Nitric acid production is measured by flow meter. Since the acid constitutes the basis of fertilizer production, its measurement must be performed with the greatest possible precision.	Error margin allowed in measurement is ± 0.1%.
2	Quantity of N ₂ O in tail gas (baseline)	Since new equipment will be installed, high-accuracy measurement results can be expected.	Error margin of ABB instrument measurement is ± 0.1%.
3	Quantity of N ₂ O in tail gas (project line)	Since new equipment will be installed, high-accuracy measurement results can be expected.	Error margin of ABB instrument measurement is ± 0.1%.
4	Ammonia consumption	Ammonia consumption will be measured automatically and continuously by the input measuring instrument of the combined reactor. Since new equipment will be installed, high-accuracy measurement results can be expected.	Error margin of measurement is ± 0.1%.
5	Natural gas used for the ammonia production	Natural gas consumption will be measured during ammonia production.	Error margin of measurement is ± 0.05%.

4.6 Data collection method

The data concerning the given period will be recorded in the 'Monitoring Report' Forms during monitoring activity (see Appendix II). Data storage requires special care in order to avoid loss of data.

4.7 The scope of data collection, its frequency and the related responsibilities

The technical manager of the acid plant will be responsible for the collection and registration of data used for measuring the project's performance.

The data will be archived both electronically (as Excel files) and by hard copies and shall be stored until 2015. Two hard copies will be made, one of which will be stored on the premises of the acid plant, while the other one will be kept outside the plant.

Parameters listed in Section 4.3 will be measured in the acid plant.

Indicators necessary for determining the project emissions and later monitored are as follows:

Table 18: Monitoring indicators

Name of indicator	Measurement method	Reliability of data	Frequency of data collection	Responsible for data collection	Method of registration
N ₂ O concentration	ABB Advance Optima Uras 14 – infrared absorption	***	continuous	Manager of acid plant	On-line
Volume of nitric acid	Certified mass flow measuring instrument	***	continuous	Manager of acid plant	On-line
Tail gas flow	Calculation	**	continuous	Manager of acid plant	On-line
Ammonia consumption	Certified volume flow measuring instrument	***	continuous	Manager of acid plant	On-line

^[1] Three levels of reliability have been separated:

*** means the perfect reliability of the data, because it is determined with such a straightforward method as mass measurement.

** means the partial reliability of the data, because it is determined with a method that involves some uncertainty

* means that the data is not very reliable, and involves a great deal of uncertainty.

4.8 Management of unexpected situations

4.8.1 Management of emissions outside the measurement limits

Nitrogénművek has been operating an ISO 9001 Quality Assurance System (QAS) since 1997 and an ISO 14001 Environment Management System (EMS) since 2000. These systems cover all the core processes of the company, including planning, implementation, maintenance, production activities, etc. QAS describes the company's organisational structure, responsibilities, procedures, as well as the processes and resources related to the development, implementation, maintenance, supervision and control of the system. The Quality Assurance Manual comprises the description of all company processes, including input and output measurements, as well as the management of unforeseeable events. Both systems will be extended to all the data collection, control and reporting processes in connection with Joint Implementation, including actions related to missing data.

The relevant measurement and calculation processes, as well as the method of monitoring will be integrated in the ISO 9001 and ISO 14001 systems of Nitrogénművek for the management of safety procedures detailed below.

The following events may result in N₂O emissions exceeding the measurement limits:

- failure of equipment, operating troubles
- disturbances to processes caused by anomalies
- unforeseeable changes in the composition of raw materials, etc.

These circumstances may result in situations in which the accurate volume of N₂O emissions cannot be determined. In the case of failures occurring in the acid plant, an emissions level might occur that cannot be measured by the instruments. In such cases, emission levels must be calculated/approximated in a way that they can be taken into account in the determination of total emissions.

If great importance is attached to exceptional emissions, the control mechanism must provide sufficient data for the estimation of the rate of such emissions. The following factors must be taken into consideration for estimates, depending on the volume of emissions:

- calculations based on changes in the average mass percentage of chemical substances involved in chemical reactions causing extraordinary emission;
- whether any of the N₂O reduction factors had any impact on the processes (catalyst, ammonia);
- to what extent the N₂O generated through chemical reactions was released into the atmosphere;
- reference data originating from other facilities;
- emission factors from international data bases or scientific studies.

In the case of the failure of the flow measuring instrument that measures the volume of nitric acid produced, the volume of acid produced can be monitored by the level indicator of the acid collection containers. The quantity produced may be calculated from the change in the container's level. The volume of acid produced can also be monitored through the quantity of ammonia used as an input of acid production.

4.8.2 Management of data loss

Should a measuring instrument break down, or the data from an instrument be lost, one or the combination of the following solutions can be applied, depending on the actual situation:

- calculations made on the basis of output performance data,
- calculations made on the basis of the average values of the nearest corresponding period,
- calculations made on the basis of the changes in the average mass percentage of substances used,
- calculations made on the basis of periodic or one-time measurements,
- operation control parameters, e.g. as a function of changes in temperature, pressure, tail gas flow,
- reference data from other facilities,
- emissions factors from international databases or scientific studies.

4.9 “Leakage”

No leakage risk concerning the Project has been identified.

4.10 Monitoring training programme

A training programme will be elaborated by external consultants for the application and uploading of the data sheets and the calculation of the project emissions. All persons involved in data collection and processing shall participate in the training programme. Apart from giving guidelines about the completion of the data sheets, the programme will also discuss the subject and aim of the Project, as well as the presentation of the obligations undertaken. Training will be organised before the launch of the Project. The aim of the monitoring training is to explain the monitoring process to those involved in the monitoring activity and make the monitoring results as accurate as possible.

4.11 Monitoring Report

The technical manager of the acid plant will be responsible for preparing the Monitoring Report. Data will be recorded each day during the entire trading period. On the basis of monthly internal reports, annual summaries must be prepared including the content described in Appendix II.

5. ENVIRONMENTAL EFFECTS

As mentioned under Section 2.3.5.2, an environmental impact study is not required for the acid plant investment, so the conditions provided for in Government Decree 20/2001 (II.14.) do not apply.

The operation established by the implementation of the Project will not have any effect on the present status of the soil/ground water and the surface waters, while it will have a positive effect on the quality of air by the reduction of N₂O, furthermore, it will result in the reduction of NO_x. The Project will not influence the emission of other gases (CO, SO₂).

6. USE OF PROCEEDS FROM SALE OF ERUS

Apart from the reduction of N₂O emissions, a further significant environmental effect of the project is that a considerable part of the proceeds of the sales of GHG emissions reductions will be applied to accomplishing the environmental objectives listed below:

Table 19: Planned environmental investments

Description	Planned timing	Environmental benefits of the investment	Cost of investment (EUR)
New nitric acid plant	2005-2007	Lower emissions More efficient energy and raw material use	42,000,000
New granulator plant	2006-2008; 2010	Reduction of dust emissions at "Pétisó" plant by use of granulator technology	20,000,000 24,000,000
Ammonium-nitrat plant: Modernization of the ammonia storage and loading system	2005	Elimination of ammonia emissions at the point of storage and loading of ammonia	23,000
"Pétisó" plant: Installation of dust filter	2005	New dustfilter to eliminate dust emissions at "Pétisó" plant	48,000
"Pétisó" plant: Reduction in air emissions	2006	Ammonia emissions reduction through condensation of steam containing ammonia	128,000
Transportation plant: Fertiliser-dust collection unit	2006	Collection of fertiliser dust dispersed during transport of fertiliser, eliminating dust contamination.	28,000
Enlargement of the waste water storage capacity in the urea and "Pétisó" plants	2007	Prevention of emissions of untreated wastewater	752,000
Water-supply department: Replacemant of the calcareous water softener	2008	Installation of a modern industrial water treatment system	1,200,000
Modernization of the railway loading facilities	2009	The loadind and extraction process of the products transported by railway is not adequate anymore. The replacement of the system is needed for healthcare and environmental reasons	1,200,000
Installation of environmental measurement equipment	2010	Measuring, collecting and processing of environmental datas to fulfill the environmental controlling tasks and averting of damage to ship	24,000
TOTAL			89,403,000

7. MAJOR RISKS DURING THE IMPLEMENTATION OF THE PROJECT

7.1 Impact of the EU ETS

Starting on 1 January 2005, the EU Emissions Trading Scheme ("EU ETS") will cover installations from five industrial sectors. The first phase of the scheme will run from 2005-07, followed by phase two, from 2008-12, alongside the first Kyoto Commitment Period and crediting of JI projects.

It will be necessary to clearly define the rules of crediting for JI projects that take place within the EU, particularly those that lead to an emissions reduction within the sectors covered by the EU ETS. Failure to do this may lead to double counting of emissions reductions. The fertilizer production unit of Nitrogénművek will not be required to participate in the EU ETS from January 2005, but may be covered by the system as of 2008.

There are two relevant questions in connection with this issue:

1. Will the coverage of the EU ETS be extended from 2008 such that Nitrogénművek will be required to participate in the scheme?
2. Should this be the case, how would this impact the Project and what provisions can be put in place now to mitigate any future risks?

7.1.1 Extension of the EU ETS to the chemical sector from 2008

The EU Directive governing the EU ETS (2003/87/EC) creates the option for the regulators to enlarge the EU ETS scheme to cover other sectors and greenhouse gases from 2008. In this regard the Directive Recitals state the following:

(15) "The inclusion of additional installations in the Community Scheme should be in accordance with the provisions laid down in this Directive, and the coverage of the Community scheme may thereby be extended to emissions of greenhouse gases other than carbon dioxide, inter alia from aluminium and chemicals activities."

In addition, Article 30 of the Directive – Review and further development – states that a report will be prepared by the Commission, covering this and other issues, and will be submitted to the European Parliament and Council by the 30 June 2006, accompanied by proposals as appropriate.

According to Commission officials, a review of the potential extension has not begun and will be dependent on the Commission's ability to compile detailed Monitoring and Reporting Guidelines for new sectors or gases. The expansion of the scheme may be limited to only one gas (methane) so that landfill sites and airlines can participate in the trading scheme.

Thus, at this stage, it remains unclear whether or not Nitrogénművek's acid plant will be covered by the EU ETS from 2008.

7.1.2 Impacts and mitigation of risks

There are two possible scenarios for Nitrogénművek, depending on the European Commission and Parliament's decision to expand EU ETS.

5. *The EU ETS is not enlarged to cover chemicals and N₂O:* Nitrogénművek will not be required to participate in the EU ETS and the project will be treated as a JI project and be credited with ERUs. The project will not lead to an indirect emissions reduction in the EU ETS trading sectors so no mechanism to avoid double counting will be required.
6. *The EU ETS is enlarged to cover chemicals and N₂O from 2008:* Nitrogénművek will be required to participate in the EU ETS and must both honour delivery obligations under the JI project contract and achieve compliance within the EU ETS. Nitrogénművek will receive an allocation of allowances and it is essential that this allocation recognises the company's JI project activity as well. Formal provisions dealing with this situation are included in an amendment to the Directive, known as the "Linking Directive."

7.1.3 The Linking Directive

The Linking Directive was agreed by European Commission on 7.04.2004 and passed by European Parliament on 20.04.2004, as an amendment to Directive 2003/87/EC. The Directive has two major consequences for the JI project of Nitrogénművek:

(1) The use of project credits for EU ETS compliance - It allows companies with obligations under the EU ETS to use JI and CDM project credits for compliance. CDM project credits will be valid from 2005 and JI project credits will be valid from 2008. The use of these credits will not be dependent on Kyoto ratification.

(2) Procedures for crediting of JI projects hosted by EU Member States – In order to ensure compatibility between the EU ETS and JI project crediting, EU Member States that host JI projects (most likely to be the New Member Countries) must reconcile ERUs promised with their National Allocation Plans under the EU ETS. Should a JI project lead directly to a reduction in emissions covered by the trading scheme (as would be the case if Nitrogénművek were covered by the scheme) then Allowances equivalent in number to the ERUs to be credited must be cancelled from the account of the operator.

Nitrogénművek will therefore seek a government guarantee such that if it is covered by the EU ETS, its 2008-12 allocation, before deduction of EUAs corresponding to the JI project reduction, will be at least equivalent to the baseline of the JI project. Such a guarantee should be included in the Letter of Approval. The Hungarian government has approved other JI projects that are already covered by or will certainly fall under the EU ETS from 2005.

This risk can be further mitigated if the buyer of Nitrogénművek's ERUs would also accept EUAs. This has the additional benefit to the buyer of reducing Kyoto and Article 6 Supervisory Committee risks because allocation under the EU ETS will be independent of

the Kyoto framework.

In conclusion, uncertainty regarding EU ETS coverage does not pose a major risk to Nitrogénművek, provided that:

(1) The Hungarian government guarantees that the allocation received under the EU ETS during 2008-12 will be at least equivalent to the project baseline before deduction of EUAs equivalent to the number ERUs to be credited, or gives a different guarantee of equivalent value, in accordance with the Linking Directive. This will leave sufficient EUAs to cover actual emissions for compliance with the EU ETS, and for Nitrogénművek to meet its delivery obligations to the buyer.

(2) The Emission Reduction Purchase Agreement (ERPA) signed by the buyer and Nitrogénművek, specifies that EUAs may be delivered as an alternative to ERUs.

7.2 The implementation of the new nitric acid plant

The installation of the catalyst depends on the establishment of the new acid plant. Therefore, if the acid plant investment falls through (e.g. the company cannot raise bank finance), the project cannot be carried out as planned or it might fail completely.

The final loan application was submitted to banks in June 2004, and on the basis of positive feedback, Nitrogénművek has a good chance to receive the credit required. According to the present status of the credit negotiations, the loan agreement may even be concluded within a month's time (i.e. in October 2004). The decision of the bank would be influenced positively if the Company could also raise finance through the sale of ERUs.

7.3 Market risk

Since the manufacturing processes of Nitrogénművek are closely interrelated, the quantity of N₂O generated depends on acid production and also on fertilizer production. We therefore survey market risks from the perspective of the end product.

Nitrogénművek Rt does not have long-term agreements on fertilizer sales. This is the nature of the product. The cooperation agreements concluded with authorised dealers usually become effective in July and remain in operation for only a year. Section 1.4.4 deals with the current and estimated market position of fertilizers in detail.

Nitrogénművek Rt decided on the implementation of the new, higher-capacity acid plant investment on the basis of its market research prepared in 2001. After Hungary's accession to the European Union, the expected export-import rate and the market demand cannot be seen clearly yet. Since acid production (thus, N₂O emission) is dependent on the demand for fertilizers, negative changes in the market carry considerable risks for the amount of N₂O emission reduction.

The change in nitric acid manufacturing related to amount of fertilizer sold in the trading

period – thus N₂O emissions – will be monitored continuously, since it is an important variable affecting the baseline and the project line (see Section 4). Based on this activity, a regular report will be prepared on the quantity of emissions reductions generated by the Project.

7.4 Legal risk

Current legislation

The Hungarian laws and regulations on air quality protection have already been harmonised with EU legislation. However, these regulations do not contain any provisions with regard to N₂O emissions. To confirm this, we examined Hungarian laws concerning air pollution caps¹³. Community laws with regard to SO₂, NO_x, CO, and dust emissions refer to Council Directive 1999/30/EC approved on 31 December 2001. However, this Directive does not regulate N₂O emissions.

Expected laws

According to information provided by the Ministry of Environment and Water (KvVM), no N₂O emissions caps will be specified in the foreseeable future. Nevertheless, in the event the air protection regulations of the EU should change and impose constraints on N₂O emissions, Hungary will be obliged to adapt to these changes. This may entail a risk in the long run.

Any future laws and regulations will be possibly based on the 1996 IPPC Directive, which also contains some provisions on fertilizer plants. The second draft of the BAT reference document (BREF) for acid production was published in March 2004; its final version will be elaborated as a result of a several years' industrial consultation, but this process is still in its initial stage. The BREF regulates emissions related to ammonia, acid and fertilizer production.

The currently available working document sets out two N₂O emission reduction possibilities.

- (i) A catalytic process occurring at high temperature (850-950°C). The catalyst is placed in the oxidation chamber after the platinum catalyst used for the combustion of ammonia.
- (ii) A catalytic process occurring at medium temperature (400-500°C). The catalyst is placed in the waste gas treatment reactor.

It is important to note that the extension of BAT to the whole industry is not very likely in the foreseeable future, because the great majority of technologies resulting in N₂O reduction are still in the experimental (laboratory and semi-industrial) phase. The appearance of a concrete technology would not give the chance to the existing plants to

¹³ Ministerial Decrees 14/2001. (V.9.) KöM-EüM-FVM and 23/2001 (XI.13.) KöM

choose the most advantageous solution from both the economic and technological points of view.

It is also important to note that the BAT of a given facility does not necessarily represent the most modern techniques and technologies available, but the economically most reasonable ones that can ensure an appropriate level of environment protection. The installation of N₂O catalysts is not obligatory at present. After the issuance of BAT, each country must decide how to integrate its provisions into its domestic laws. The authority does not prescribe the application of a concrete technology (it can only make recommendations), and the environment user has to show and justify how the technology applied conforms to BAT requirements.

Currently, only France has operational regulations concerning the reduction of N₂O emissions (Ministerial Decree issued on 2 February 1998). The maximum amount allowed in tail gas is 7 kg/t acid (~1100 ppm). This strict regulation can be justified by the fact that France needs to impose these N₂O reduction measures in order to meet its obligations arising from the Kyoto Protocol. Owing to the changes and different structures established in the individual industrial sectors after the shift to market economy, Hungary has an emission allowance surplus at present, and thus, no N₂O emissions regulations may be expected in order to achieve the 6% emissions reduction undertaken as compared to the 1985-1987 average emissions level.

7.5 Construction risk factors

The company carrying out the construction work will be selected on the basis of a tender. As the most important condition of selection, the companies supplying the equipment and carrying out the construction work must have appropriate references in the field of building acid production facilities. This reduces the risks arising from construction.

7.6 Technological risk

Only experimental technologies exist for the reduction of N₂O emissions and the industrial scale technology operates in only one facility (Agrolinz, Austria) at present. The technological risk primarily arises from the novelty of catalysts applied for N₂O emissions reduction. Understanding the operation of a new piece of equipment thoroughly takes several years of operational experience. The best example for this is the catalyst operating at high temperature developed by BASF, which was recently revealed to have a negative impact on acid production processes and to be unreliable for reasons of operational safety.

The risk can be reduced if the supplier is selected based on the results of the available references. Since the installation of the catalyst takes only a short time if the reactor is available, the construction can be carried out directly before the commissioning of the acid plant. Owing to the rapid development of catalyst technology, the most modern insert material can be possibly used at the date of implementation.

7.7 Operational risk

Since the catalyst to be installed by Nitrogénművek is a separable part of the technology, its failure will not affect the technology of acid production considerably, although it will result in increased N₂O and NO_x emissions. The inappropriate operation of the catalyst mainly poses a risk for NO_x emissions, since the increased level of such emissions will have a negative impact on the company's environmental performance.

The equipment may involve an operational risk due to its novelty, but this risk can be reduced through the continuous experiences gained.

8. STAKEHOLDER COMMENTS

Prior to the investment, Nitrogénművek considered it important to provide sufficient information for (mainly regional) organisations and nearby local governments whose activity might be affected by or somehow connected to the implementation of the project.

Since the industrial plant operating in Pétfürdő has already been in contact with the organisations and local councils concerned many times (mainly in the course of official permitting procedures), the latter are aware of the operations conducted on the industrial site and the plant. Besides local councils and other local bodies, national organisations, such as the Ministry of Environment and Water Management and the Energy Club Environment Protection Association were also included in the list of stakeholders. Stakeholders received a brief summary on the planned investment and its potential impacts. The aim of this briefing was to inform the stakeholders on the background, objectives, implementation, impacts of the project, as well as the technology introduced. Furthermore, the briefing also aimed to give them the opportunity to make remarks, suggestions or objections on the basis of information provided. The information document was sent to stakeholders on 1 October 2004, and recipients had 14 days to respond. The list of organisations concerned is included in Appendix III.

The briefing document contained the following major information:

- Activity of Nitrogénművek Rt;
- The importance of reducing the N₂O content of the atmosphere;
- Details about the N₂O reduction investment (acid production process, technological feasibility of N₂O reduction, achievable emissions reduction);
- Information on the additionality of the Project;
- Role of stakeholders in the evaluation process.

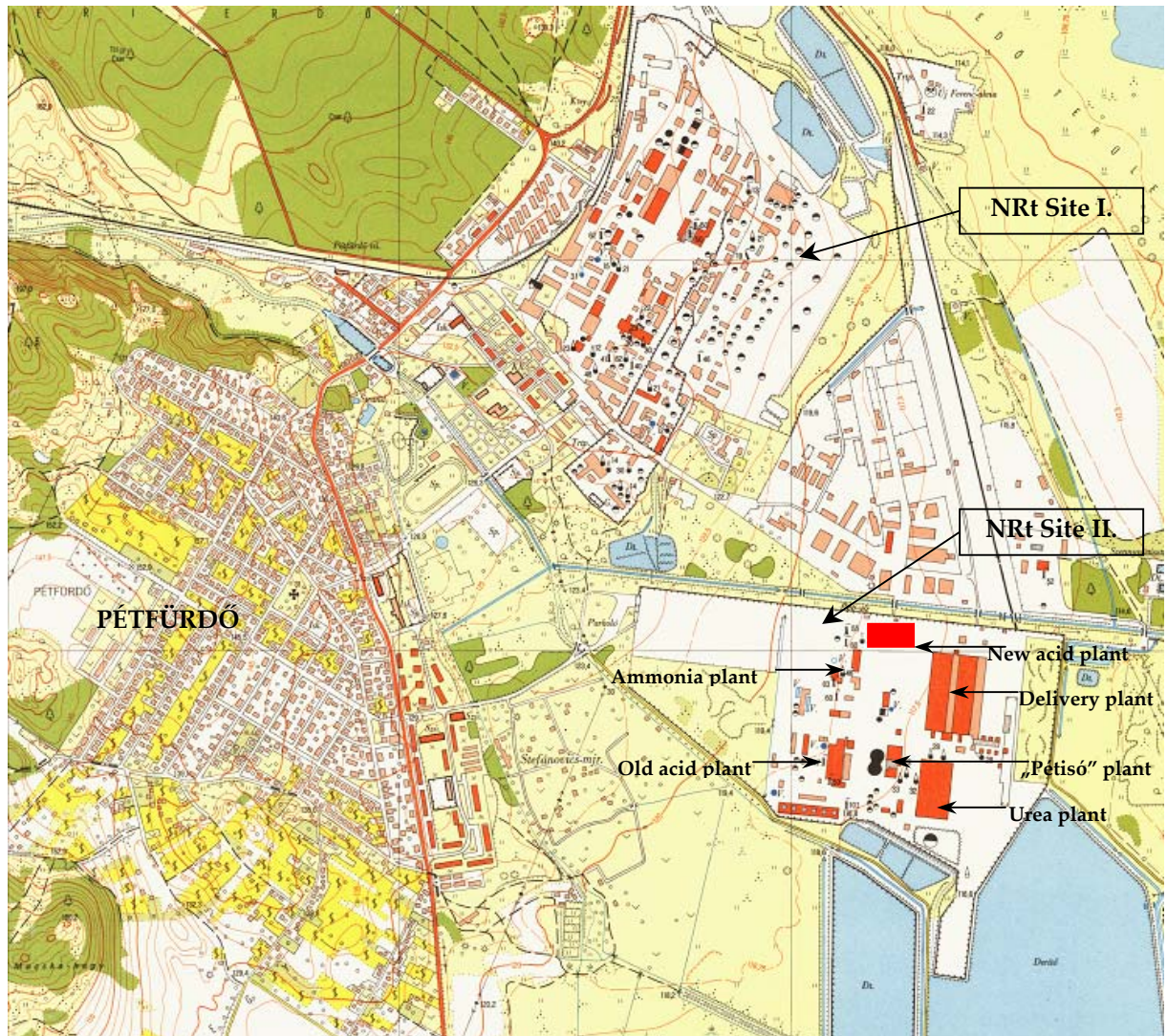
Out of those organisations and local councils that received the briefing document, the following wished to express their opinion on the subject:

	Organisation	Respondent
1	Mayor's Office, Várpalota City Council	Tibor Leszkovszki, Mayor
2	Town Protection and Development Society	Ferenc Schmidt

None of the organisations and local governments notified made a remark in writing with regard to the project, no objections were received by Nitrogénművek.

The respondents regarded the environmental investment of Nitrogénművek as positive. As for air protection, Nitrogénművek assured the participants that emission caps set out in laws and regulations will be observed during the operation of the new equipment.

I. APPENDIX: THE LOCATION OF NITROGÉN MŰVEK AND THE PROJECT



II. APPENDIX: MONITORING AND REPORTING SHEETS

Contents of the yearly monitoring report

	Table of contents
1.	General information
	Name of the company and the site
	Contact
	Address and phone
	Duration of the monitoring
2.	Production description
	Technology description
	Key factors influence the production
	Key factors influence the activity
	Environmental effects
3.	Monitoring activity
	Used monitoring methodology
	Correction
4.	Measurement results
	Unaccepted situation
	Deal with the unaccepted situation
	N ₂ O emission reduction
	CO _{2eq} emission reduction

Attached monitoring sheets

Project line monitoring

Project line monitoring		January	February	March	December
Monthly acid production (measured)	t/month						
Operating time	day/month						
Hourly acid production	t/hour						
Quantity of tail gas (calculated)	eNm ³ /month						
N ₂ O concentration in tail gas	ppmv						
Quantity of N ₂ O in tail gas	tf%						
Annual N ₂ O flow, volume	eNm ³						
Annual N ₂ O amount	tN ₂ O/month						
N ₂ O emission factor	CO ₂ e	310	310	310	310	310	310
Monthly CO ₂ e emission from the acid production	tCO ₂ e/month						
Ammonia need of the catalyst (measured)	t						
Ammonia specific of the natural gas	gNm ³ /t NH ₃	1,082	1,082	1,082	1,082	1,082	1,082
Used amount of natural gas	gNm ³						
Average heating volume of the natural gas	MJ/gNm ³						
Heating volume of the used natural gas	MJ						
CO ₂ e emission factor of the natural gas	tCO ₂ /MJ	0.0000561	0.0000561	0.0000561	0.0000561	0.0000561	0.0000561
Monthly CO ₂ emission from ammonia production	tCO ₂						
Monthly CO₂e emission	tCO₂e/month						

Yearly N₂O emission

Yearly CO₂e emission

Baseline monitoring

Baseline monitoring		January	February	March	December
Monthly acid production (measured)	t/month						
Operating time	day/month						
Hourly acid production	t/hour						
Quantity of tail gas (calculated)	eNm ³ /month						
N ₂ O concentration in tail gas (monthly average of measurement)	ppmv						
N ₂ O quantity in tail gas	tf%						
Annual N ₂ O flow, volume	eNm ³						
Annual N ₂ O amount	tN ₂ O/month						
N ₂ O emission factor	CO ₂ e	310	310	310	310	310	310
Monthly CO ₂ e emission	tCO ₂ e/month						

Yearly N₂O emission

Yearly CO₂e emission

III. APPENDIX: ORGANISATIONS CONCERNED

Organisation	Contact person	Town	Address	Post code	Other (name, activity, e-mail, tel.)
Ministry of Environment and Water Management	Anikó Pogány	Budapest	Fő u. 44-50.	1011	Adrienn Borsyné Dunai
Séd-Balaton Environment and Nature Protection Association		Balatonfűzfő	Bartók Béla u. 18.	8175	Protection and support of natural environment
Papkeszi Village Development Society		Papkeszi	Dózsa Gy. U. 7.	8183	Protection and support of social environment
Szentkirályszabadja Environment Protection and Town Development Society		Szentkirályszabadja	Viola u. 4.	8225	Multi-purpose and other environmental support
Csalán Environment and Nature Protection Association	Mónika Mátyás	Veszprém	Pf. 222.	8200	Tímea Szalay Protection and support of natural environment Tel: 578-390
Village Development Society		Vilonya	Kossuth u. 18.	8124	Protection and support of natural environment
Energy Club Environment Protection Association		Budapest	Szerb u. 17.-19.	1056	
Mayor's Office, Várpalota City Council	Tibor Leszkovszki, Mayor	Várpalota	Gárdonyi Géza utca 39.	8100	e-mail: leszkovszki.tibor@varpalota.hu
Várpalota and its Region Municipal Regional Development Society	Károly Pál, Regional Manager	Várpalota	Gárdonyi u. 39.	8200	TEL: 592 692 FAX: 592 669 592 676 e-mail: pal.karoly@varpalota.hu
Local Council of the Village of Pétfürdő	Éva Horváth, Mayor	Pétfürdő	Berhidai u. 6	8105	
Town Protection and Development Society	Ferenc Schmidt, Representative	Pétfürdő	Berhidai u. 6	8105	

N₂O emissions reduction project at the new acid plant at Nitrogénművek Rt.

Várpalota-Pétfürdő Gardener's Society	Béla Nagy Gyevi	Pétfürdő	Régibánya u. 21.	8105	
'For the Town of Berhida' Public Foundation		Berhida	Veszprémi u. 1- 3.	8181	Town development, nature protection
Local Council of the Town of Berhida	József Lajosfalvi, Mayor	Berhida	Veszprémi u. 1- 3.	8181	
Local Council of the Village of Ösi	dr. László Bogárdi, Mayor	Ösi	Kossuth u. 40.	8161	